"To enrich lives through effective and caring service"

Los Angeles County Beaches & Harbors
Caring for Your Coast

Stan Wisniewski
Director

Kerry Silverstrom
Chief Deputy

April 5, 2007

The Honorable Board of Supervisors
County of Los Angeles
383 Kenneth Hahn Hall of Administration
500 West Temple Street
Los Angeles, California 90012

Dear Supervisors:

CONTRACT FOR MARINE ENVIRONMENT MONITORING AND ANALYSIS IN MARINA DEL REY (FOURTH DISTRICT) (3 VOTES)

IT IS RECOMMENDED THAT YOUR BOARD:

Approve award of and instruct the Chairman to execute the attached one-year contract (Attachment 1), plus four one-year extension options, with Aquatic Bioassay & Consulting Laboratories, Inc. for marine environment monitoring and analysis services within the Marina del Rey Small Craft Harbor, at an annual County cost not to exceed $127,355, and authorize the Director of Beaches and Harbors to increase the contract amount by a sum not exceeding 20 percent during each contract year for additional, unforeseen monitoring services within the scope of this contract.

PURPOSE/JUSTIFICATION OF RECOMMENDED ACTION

Award of the contract will enable the Department to continue to benefit from the retained services of a marine environmental professional. The marine environment monitoring program in the Marina del Rey Small Craft Harbor has been conducted on an almost annual basis for the past 25 years and has been provided by a private contractor since 1996. Continuing the collection of data for water quality, sediment chemistry, infauna and fish assemblages and monitoring the current water quality and ecology of the Harbor enables the Department to respond to numerous inquiries about

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the environmental health of the Marina both on a historical and current basis. Furthermore, the contract enables the Department to provide marine environmental studies as may be required by grants awarded to the Department.

Implementation of Strategic Plan Goals

The services provided by Aquatic Bioassay & Consulting Laboratories, Inc. will promote and further the Board-approved Strategic Plan Goal of "Public Safety", by monitoring and documenting water quality and promoting its improvement.

FISCAL IMPACT/FINANCING

The total compensation for all County-funded marine environment monitor services is not to exceed $127,355 in any contract year. Work will be payable based on hourly billings at specified contract rates. Subject to approval in the County budget process, the contract provides that the Director may increase the maximum annual amount of County-funded compensation by up to 20 percent in any year of the contract or any extension period.

The contractor will bill for the monitoring services at fixed hourly rates up to the annual maximum. The service will be provided on a regular and continuous basis, including weekends and holidays, between the hours of 7:00 a.m. and 6:00 p.m.

The cost of this contract is included in the Department's 2007-2008 proposed budget.

FACTS AND PROVISIONS/LEGAL REQUIREMENTS

The Department is requesting award of a contract to Aquatic Bioassay & Consulting Laboratories, Inc., which was determined to be the most responsible, responsive proposer. The contract term is one year with four one-year extension options that may be exercised at the Director's discretion. The contract services will commence on the date of approval by your Board.

The contract will provide a team of experienced staff who will perform, analyze and report on the sampling and testing of water, fish and other animal life and sediment within the Marina del Rey Small Craft Harbor.

The contract contains the County's standard provisions regarding contractor obligations and is in compliance with all Board, Chief Administrative Office and County Counsel requirements.

The contract has been approved as to form by County Counsel.

CONTRACTING PROCESS

This contract solicitation was advertised in the Los Angeles Times, the Daily Breeze, the Los Angeles Daily News, the Santa Monica Daily Press, the Lynwood Journal, the Compton Bulletin, the Eastside Sun, the Culver City News and the Los Angeles Watts Times. The opportunity was also advertised on the County's Bid Web page (Attachment 2), as well as the Department's own Internet site. In addition, notices were sent out by direct mail to a list of 338 contractors.

Three firms submitted proposals, met the Request for Proposals (RFP) minimum requirements, and were evaluated. A three-person evaluation committee, composed of two staff members from the Department's Planning Division and one member from the Department of Public Works, evaluated the proposals based on a weighted evaluation of: (1) experience (250 points); (2) organizational resources (250 points); (3) price (350 points); and (4) references (150 points). The committee determined that Aquatic Bioassay & Consulting Laboratories, Inc. had the ability, experience and resources to provide the Department with quality marine environment monitoring services as substantiated through its submitted proposal.

Aquatic Bioassay & Consulting Laboratories, Inc. has extensive experience working with the Department; it serves as the current contractor and has provided marine environment monitoring services over the past ten years. Additionally, its cost was $52,194 less annually than the next lowest bid, thereby making its service the most cost effective and highest rated of all proposals received. The Director has considered the committee's findings and recommends that your Board approve the contract with Aquatic Bioassay & Consulting Laboratories, Inc.

Attachment 3 details the minority and gender composition of the qualifying firms. Aquatic Bioassay & Consulting Laboratories, Inc. is not a County-certified Community Business Enterprise. However, on final consideration of award, Aquatic Bioassay & Consulting Laboratories, Inc. was selected without regard to gender, race, creed or color.

IMPACT ON CURRENT SERVICES (OR PROJECTS)

The Department is currently contracting for these marine environmental monitoring services through one private sector contract and this contract will continue that practice.

There will be no impact on other County services or projects.

CONCLUSION

Instruct the Executive Officer to send one approved copy of this letter and two executed copies of the contract to the Department of Beaches and Harbors.

Respectfully submitted,

Stan Wisniewski

Stan Wisniewski, Director

SW:so
Attachments (3)
C: Chief Administrative Officer
County Counsel
Executive Officer, Board of Supervisors

LOS ANGELES COUNTY DEPARTMENT OF BEACHES AND HARBORS
CONTRACT FOR MARINE ENVIRONMENT MONITORING AND ANALYSIS IN MARINA DEL REY

PART ONE – GENERAL CONDITIONS

1.1 INTRODUCTION

1.1.1 Parties. This Contract is entered into by and between the County of Los Angeles (the "County") and Aquatic Bioassay and Consulting Laboratories, Inc. (the "Contractor").

1.1.2 Recitals. The Contract is intended to integrate within one document the terms for the marine environment monitoring to be performed for the County by the Contractor. The Contractor represents to the County that the express representations, certifications, assurances and warranties given in this Contract, including but not limited to those in Sections 3.2, 3.3, 3.4, 3.6, 3.21 and 3.31 and in Form P-1 (Offer to Perform) and Form Form P-2 (Proposer's Work Plan) are true and correct. The Contractor further represents that the express representations, certifications, assurances and warranties given by the Contractor in response to the Request for Proposals are true and correct, including but not limited to Forms P-3, P-4, P-5, P-6, P-7 and P-8, submitted with the Contractor's Proposal.

1.1.3 Effective Date. The effective date of this Contract shall be upon the date of Board approval.

1.1.4 Contract Provisions. The Contract is comprised of this Part 1 (General Conditions), Part 2 (Statement of Work), Part 3 (Standard Contract Terms and Conditions), Form P-1 (Offer to Perform), and Form P-2 (Proposer's Work Plan), all of which are attached to this Contract and incorporated by reference. It is the intention of the parties that when reference is made in this Contract to the language of the Request for Proposals (RFP), the Exhibits or the Proposal, such language shall be deemed incorporated in the Contract as if fully set forth. To the extent there is any inconsistency between the language in Forms P-1 and P-2 and any other part of the Contract, the language of such other part of the Contract shall prevail.

1.1.5 Work to be Performed. Contractor shall perform the work set forth in Part 2, Statement of Work and Form P-2.

1.1.6 Rescission. The County may rescind the Contract for the Contractor's misrepresentation of any of the matters mentioned in Section 1.1.2. In the case of a misrepresentation of the facts set forth in Section 3.7, a penalty may be assessed in the amount of the fee paid by the Contractor to a third person for the award of the Contract.

1.1.7 Supplemental Documents. Prior to commencing services under the Contract, the selected Proposer shall provide the Contract Administrator with satisfactory written proof of insurance complying with Section 3.9.

1.2 INTERPRETATION OF CONTRACT

1.2.1 Headings. The headings contained in the Contract are for convenience and reference only. They are not intended to define or limit the scope of any provision of the Contract.

1.2.2 Definitions. The following words shall be construed to have the following meanings, unless otherwise apparent from the context in which they are used.

Board, Board of Supervisors. The Board of Supervisors of Los Angeles County.

Chief Deputy. The Chief Deputy of the Department.

Contract. An agreement for performance of the work between the selected Proposer and the County, approved by the Board of Supervisors, which incorporates the items enumerated in Section 1.1.4.

Contract Administrator (CA). The Chief, Planning Division or a designated representative.

Contractor(s). The Proposer(s) whose Proposal is accepted by the Board of Supervisors for performance of the Contract work.

Contract Period. The period commencing on the effective date of the Contract and expiring on June 30, 2008, and thereafter, each succeeding twelve-month period over the remaining term including the optional years.

County. The County of Los Angeles.

County Counsel. The Los Angeles County Counsel.

Department. The Los Angeles County Department of Beaches and Harbors.

Director. The Director of the Department.

Offer to Perform. Form P-1 of the Contract.

Performance Standard. The essential terms and conditions for the performance of the Contract work as defined in the Contract.

Proposer. Any person or entity authorized to conduct business in California who submits a Proposal.

Request for Proposals (RFP). The solicitation to this Contract issued December 20, 2006

Subcontractor. A person, partnership, company, corporation, or other organization furnishing supplies or services of any nature, equipment, or materials to the Contractor, at any tier, under written agreement.

Work Order. An agreement, subordinate to the Contract, incorporating all of its terms and conditions, by which the Contractor is authorized to perform specific tasks outlined in the Description of Work. See Exhibit 2.

1.3 CONTRACT TERM

1.3.1 Initial Term. The initial Contract term shall commence on the date of approval of the Contract by the Board of Supervisors and expiring on June 30, 2008.

1.3.2 Four One-Year Extension Options. If the Director determines that it is in the interest of the County to do so, he may grant up to four one-year extensions of the Contract term. The Director may exercise the first option by notifying the Contractor(s) in writing before the Contract expiration date. The Director may exercise the following options by notifying the Contractor(s) in writing before the expiration of the previous optional Contract Year.

1.3.3 Extension to Complete Work Order. The Director may extend the Contract term or any optional Contract Year on a month-to-month basis subject to the Contract's terms and conditions, but only to allow the Contractor to complete a Work Order approved before the expiration of the Contract term or optional Contract Year. Such extensions are further subject to the availability of funds in the Department's budget. Up to 12 such one-month extensions may be granted, which shall be effective only if executed in writing by the Director or Chief Deputy.

1.3.4 Survival of Obligations. Notwithstanding the stated term of the Contract, some obligations assumed in the Contract shall survive its termination, such as, but not limited to, the Contractor's obligation to retain and allow inspection by the County of its books, records and accounts relating to its performance of the Contract work.

1.4 COMPENSATION

1.4.1 Contract Sum. The net amount the County shall expend from its own funds during any Contract year for marine environmental monitor services among all Contractors shall not exceed $127,355. The County may at its discretion expend any portion, all or none of that amount. However, aggregate annual payments for marine environmental monitor services may exceed the aforementioned $127,355 to the extent that a lessee, County Department other than the Department, government agency or third party is obligated to reimburse the Department for its marine environmental monitor project expenses.

1.4.2 Increase of Contract Sum by Director. Notwithstanding Section 1.4.1, the Director may, by written notice to the Contractor(s), increase the $127,355 sum referenced in Section 1.4.1 which is not subject to reimbursement from lessee, County Department, government agency or third party by up to 20 percent in any year of the Contract or any extension period, subject to

the availability of funds in the Department's budget. Such increases shall not be cumulative.

1.4.3 Compensation Payable Only Under Work Order at Quoted Hourly Rates. Notwithstanding any other provisions of this Contract, no compensation shall be paid unless and until the Contractor has performed work for the Department in accordance with the terms of a Work Order (Exhibit 2) issued under the Contract and executed by the Director or the Chief Deputy Director. Compensation for all work under a Work Order shall be at Contractor's hourly rate(s) of pay as quoted on Form P-1, and shall be subject to Sections 1.4.1 and 3.1.

1.4.4 Increase in Maximum Compensation Under Work Order. The Director may approve an increase in the maximum compensation specified in a Work Order should he find that the project will require additional hours, an increase in staffing, or other cause to do so. An increase in the maximum compensation specified in a Work Order shall not increase the Contractor's hourly rate(s) of compensation. Approval of an increase in the maximum compensation specified in a Work Order shall be effective only if executed in writing by the Director or Chief Deputy, who shall state the reason for the increase.

1.4.5 Extension of Time to Complete Work Order. Approval of an extension of time to completion of a Work Order shall be effective only if executed in writing by the Director or Chief Deputy.

1.4.6 Contractor's Invoice Procedures.

1.4.6.1 The Contractor shall submit an invoice to the Department on or before the fifteenth day of each month for compensation earned during the preceding calendar month. The Contractor shall submit two copies of each invoice and shall submit a separate invoice for each Work Order on which it claims payment. Invoices shall identify the Contract number and the name of the Work Order or project. Invoices for services billed on an hourly basis shall itemize dates and hours of work performed, type of work performed, person performing the work, hourly rate for such person, and other information necessary to calculate the payment for the work.

1.4.6.2 If the Work Order requires delivery of a report or other written product, fifty percent of all amounts due under the Work Order shall be withheld until receipt and acceptance by the CA of the report or other matter. The Contractor's monthly invoice shall show the amount earned subject to such withholding, the deduction for the amount to be withheld, and the net amount currently payable by the County.

1.4.6.3 Upon the Department's receipt and the CA's review and approval of the invoice, the County shall pay the net amount currently payable shown on the invoice less any other setoff or deduction authorized by the Contract. Such setoffs and deductions include, but are not limited to, the cost of replacement services.

1.4.6.4 Upon completion of the reports or other deliverable items identified in the Work Order, the Contractor shall deliver them with an invoice for the amounts withheld pending their receipt and acceptance. Upon their receipt and approval by the CA, the County shall pay the amounts withheld, provided that the County's maximum obligation for the Work Order is not exceeded. Approval or rejection of reports and other deliverable items identified in the Work Order shall not be unreasonably withheld and shall not exceed four weeks from the date of their receipt by the County.

LOS ANGELES COUNTY DEPARTMENT OF BEACHES AND HARBORS
CONTRACT FOR MARINE ENVIRONMENT MONITORING AND ANALYSIS IN MARINA DEL REY

PART TWO – STATEMENT OF WORK

2.1 GENERAL REQUIREMENTS

2.1.1 Contractor's Offer to Perform. Subject to all other terms and conditions of the Contract, Contractor shall perform the work and maintain quality control in accordance with the Offer to Perform, Work Order and other representations submitted with the Contractor's Proposal.

2.1.2 Contractor Expenses. The Contractor will provide all materials and equipment necessary to carry out any projects agreed to by the Parties, unless the Project Agreement provides that the Department shall provide any necessary materials and equipment.

2.1.3 Contractor's Office. The Contractor shall maintain a local address within the County at which the Contractor's Representative may be contacted personally or by mail.

2.1.4 Communication with Department. The Contractor shall maintain communication systems that will enable the Department to contact the Contractor at all times during the Department's regular business hours. The Contractor shall return calls during business hours no later than the next business day and as soon as reasonably possible if the call is designated urgent. The Contractor shall provide an answering service, voicemail or telephone message machine to receive calls at any time Contractor's office is closed.

2.1.5 Personal Services of Designated Persons Required. In agreeing to engage the Contractor, the County has relied on the Contractor's representation that the individuals identified in the Contractor's Proposal will personally perform the professional services required by the Contract. The failure of those persons to render those services shall be deemed a material breech of the Contract for which the County may terminate the Contract and recover damages. Should it be necessary for the Contractor to substitute an equally qualified professional for an individual named in the Proposal, the Contractor shall request the Contract Administrator's approval, which shall not be unreasonably withheld.

2.1.6 Contractor to Make Semi-Monthly Reports. The Contractor shall report to the Contract Administrator on a semi-monthly basis in writing, describing the services rendered and matters delivered during the period, the charges for the services rendered, the balance of funds remaining under the Work Order and the Contract, and any facts which may jeopardize the completion of the project or any intermediate deadlines.

2.1.7 Contractor to Prepare Final Project Report. When required by the Work Order, the Contractor shall prepare a final written report upon completion of the assigned work summarizing the Contractor's project, findings, recommendations and plans in accordance with the Contract Administrator's instructions.

2.2 PERSONNEL

2.2.1 Contractor's Representative (CR). The Contractor shall designate a full-time employee as Contractor's Representative (CR) who shall be responsible for Contractor's day-to-day activities related to each Work Order and shall be available to the County Contract Administrator on reasonable telephone notice each business day and at other times as required by the work. The Contractor may designate himself or herself as the Contractor's Representative.

2.2.2 Professional Staff. Contractor shall provide the professional staff necessary to conduct marine, water, fish and sediment sampling, testing and analysis identified in the Contractor's Proposal.

2.2.3 County Contract Administrator (CA).

2.2.3.1 The Chief, Planning Division shall be the Contract Administrator (CA) who shall have the authority to act for the County in the

administration of the Contract except where action of the Director or Chief Deputy is expressly required by the Contract.

2.2.3.2 The CA will be responsible for ensuring that the objectives of the Contract are met and shall direct the Contractor as to the County's policy, information and procedural requirements.

2.2.3.3 The Contractor's work shall be subject to the CA's acceptance and approval, which shall not be unreasonably withheld.

2.2.3.4 The CA is not authorized to make any changes in the terms and conditions of the Contract or to obligate the County in any manner.

2.3 SERVICES TO BE PROVIDED

The Contractor's services shall include, but are not limited to the following:

- The Contractor will work with the Department in an effort to develop Work Orders for CA approval;
- The Contractor will adequately staff projects for the Department;
- The Contractor will engage in and conduct marine, water, fish and sediment sampling, testing and analysis projects;
- Conduct monthly Water quality monitoring as specified in Exhibit 4;
- Conduct semiannual fish surveys as specified in Exhibit 5;
- Conduct annual sediment chemistry surveys as specified in Exhibit 6;
- Submit annual report within 120 days of completion of field and laboratory analyses, unless the period is extended by mutual agreement by the Parties. The annual report shall include data gathered for the current year and comparison with previously documented surveys. Following a four week review period for corrections, 15 copies of the final annual report shall be printed and furnished to the County;
- The Contractor will procure all project related materials unless otherwise agreed to by the Parties;
- The Department will provide the Contractor with any plans or specifications necessary to carry out projects agreed to by the Parties, unless the Work Order provides that the Contractor shall prepare plans and specifications;
- The Department will obtain any necessary permits or approvals required by law for the carrying out of any project contemplated by this Agreement, unless such responsibility is expressly delegated to the Contractor in the Work Order;
- The CA or his designee will review all work performed by the Contractor and provide evaluations of said work on a regular basis;
- The Contractor will perform other duties as required by the Director.

2.4 QUALITY ASSURANCE

2.4.1 Purpose of Standards. The Contractor will observe, at a minimum, the standards set forth in this Section 2.4, and acknowledges that the adequacy of its compliance with the Contract shall be measured by these standards as well as all other terms and conditions of the Contract.

2.4.2 Performance Evaluation. The County or its agent will evaluate Contractor's performance under this Contract on not less than an annual basis. Such evaluation will include assessing Contractor's compliance with all Contract terms and performance standards. Contractor's deficiencies which the County determines are severe or continuing and that may place performance of the Contract in jeopardy if not corrected will be reported to the Board of Supervisors. The report will include improvement/corrective measures taken by the County and Contractor. If improvement does not occur consistent with the corrective action measures, County may terminate this Contract or impose other penalties as specified in this Contract.

2.4.3 Contractor's Quality Control Plan. The Contractor shall comply with Contractor's Quality Control Plan (Form P-3), which shall be incorporated in the Contract by reference. To

the extent that provisions of Contractor's Quality Control Plan are inconsistent with any other part of the Contract, they shall be ineffective. The Contractor shall not change the Quality Control Plan without written approval of the Director or his designee.

2.4.4 Applicable Professional Standards to be Followed. The Contractor and its professional staff shall exercise independent judgment and complete each assignment in accordance with the professional standards of ethics and competence which apply to monitoring services.

2.4.5 Conflicts of Interest. Contractor shall accept no employment which conflicts with its obligations to the County under the Contract and shall disclose any existing potential or actual conflict of interest prior to accepting an assignment.

The prohibition shall continue in effect until the later of (1) one year from the termination or expiration of this Contract or any extension period; or (2) if the Contractor has performed work for the County related to an interest of the person or entity offering employment, the prohibition on accepting employment from that person or entity shall continue until the date of execution of an agreement or other conclusion of all negotiations between the County and that person or entity.

However, at no time after termination or expiration of the Contract or any extension period may the Contractor disclose to any third person any confidential information learned or developed as a result of its work under this Contract or accept employment regarding subject matter as to which the Contractor learned or developed any confidential information as a result of employment by the County.

2.4.6 Other Standards to be Followed.

2.4.6.1 Contractor shall meet deadlines set by CA.

2.4.6.2 Reports required by the Contract or any Work Order shall be completed on time.

2.4.6.3 Contractor's employees shall appear on time for meetings and presentations and conduct themselves professionally.

2.4.6.4 Hourly services shall be accurately reported.

2.4.6.5 Calls of County agents, employees, and contractors shall be returned promptly in accordance with Section 2.1.4.

2.4.6.6 Insurance shall never be allowed to lapse. Proof of insurance shall comply with Contract requirements in all respects, including but not limited to state authorization of insurer, presence of each required coverage, and policy limits.

LOS ANGELES COUNTY DEPARTMENT OF BEACHES AND HARBORS
CONTRACT FOR MARINE ENVIRONMENT MONITORING AND ANALYSIS IN MARINA DEL REY

PART THREE – STANDARD CONTRACT TERMS AND CONDITIONS

3.1 LIMITATION OF COUNTY'S OBLIGATION IN CASE OF NONAPPROPRIATION OF FUNDS

3.1.1 The County's obligation is payable only and solely from funds appropriated for the purpose of this Contract. All funds for payment after June 30th of any fiscal year are subject to County's legislative appropriation for this purpose. Payments during subsequent fiscal periods are dependent upon the same action.

3.1.2 In the event this Contract extends into succeeding fiscal year periods, and if the governing body appropriating the funds does not allocate sufficient funds for the next succeeding fiscal year's payments, then the services shall be terminated as of June 30th of the last fiscal year for which funds were appropriated.

3.2 NONDISCRIMINATION IN EMPLOYMENT

3.2.1 The Contractor shall take affirmative action to ensure that qualified applicants are employed, and that employees are treated equally during employment, without regard to their race, color, religion, sex, ancestry, age, physical disability, marital status, political affiliation, or national origin. Such action shall include, by way of example without limitation: employment; upgrading; recruitment or recruitment advertising; demotion or transfer; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

3.2.2 The Contractor certifies and agrees that all persons employed by the Contractor, its affiliates, subsidiaries or holding companies, are and will be treated equally by the employer without regard to or because of race, color, religion, sex, ancestry, age, physical disability, marital status, political affiliation, or national origin, and in compliance with all antidiscrimination laws of the United States of America and the State of California.

3.2.3 The Contractor certifies and agrees that it will deal with its Subcontractors, bidders, or vendors without regard to their race, color, religion, sex, ancestry, age, physical disability, marital status, political affiliation, or national origin.

3.2.4 The Contractor shall allow the County access to its employment records during regular business hours to verify compliance with these provisions when requested by the County.

3.2.5 If the County finds that any of the above provisions have been violated, the same shall constitute a material breach of contract upon which the County may determine to terminate the Contract. While the County reserves the right to determine independently that the antidiscrimination provisions of the Contract have been violated, a final determination by the California Fair Employment Practices Commission or the Federal Equal Employment Opportunity Commission that the Contractor has violated state or federal antidiscrimination laws shall constitute a finding on which the County may conclusively rely that the Contractor has violated the antidiscrimination provisions of the Contract.

3.2.6 The parties agree that in the event the Contractor violates the antidiscrimination provisions of the Contract, the County shall at its option be entitled to a sum of five hundred dollars ($500) pursuant to Section 1671 of the California Civil Code as damages in lieu of terminating the Contract.

3.3 ASSURANCE OF COMPLIANCE WITH CIVIL RIGHTS LAWS. The Contractor hereby assures it will comply with all applicable federal and state statutes to the end that no person shall, on the grounds of race, religion, ancestry, color, sex, age, physical disability, marital status, political affiliation or national origin, be excluded from participation in, be denied the benefits of, nor be otherwise subjected to discrimination

under the Contract or under any project, program, or activity supported by the Contract.

3.4 COMPLIANCE WITH FEDERAL, STATE AND LOCAL LAWS

3.4.1 The Contractor agrees to comply with all applicable federal, state, County and city laws, rules, regulations, ordinances, or codes, and all provisions required by these laws to be included in the Contract are incorporated by reference.

3.4.2 The Contractor warrants that it fully complies with all statutes and regulations regarding the employment eligibility of foreign nationals; that all persons performing the Contract work are eligible for employment in the United States; that it has secured and retained all required documentation verifying employment eligibility of its personnel; and that it shall secure and retain verification of employment eligibility from any new personnel in accordance with the applicable provisions of law.

3.4.3 The Contractor agrees to indemnify and hold the County harmless from any loss, damage or liability resulting from a violation on the part of the Contractor of such laws, rules, regulations or ordinances.

3.5 GOVERNING LAW. The Contract shall be construed in accordance with and governed by the laws of the State of California.

3.6 COVENANT AGAINST CONTINGENT FEES

3.6.1 The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure the Contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies under contract with the Contractor for the purpose of securing business.

3.6.2 The County shall have the right to terminate the Contract for a breach of this warranty, and, at its sole discretion, recover from the Contractor by way of such means as may be available the full amount of any commission, percentage, brokerage or contingent fee paid.

3.7 TERMINATION FOR IMPROPER CONSIDERATION

3.7.1 The County may, by written notice to the Contractor, immediately terminate the right of the Contractor to proceed under this Contract if it is found that consideration, in any form, was offered or given by Contractor, either directly or through an intermediary, to any County officer, employee or agent with the intent of securing the Contract or securing favorable treatment with respect to the award, amendment or extension of the Contract or the making of any determinations with respect to the Contractor's performance pursuant to the Contract. In the event of such termination, the County shall be entitled to pursue the same remedies against the Contractor as it could pursue in the event of default by the Contractor.

3.7.2 Among other items, such improper consideration may take the form of cash, discounts, services, tangible gifts or the provision of travel or entertainment.

3.7.3 The Contractor shall immediately report any attempt by a County officer, employee or agent to solicit such improper consideration. The report shall be made either to the County manager charged with the supervision of the employee or to the County Auditor-Controller's Employee Fraud Hotline at (213) 974-0914 or (800) 544-6861.

3.8 INDEMNIFICATION. The Contractor shall indemnify, defend and hold harmless the County and its Special Districts, elected and appointed officers, employees and agents ("County") from and against any and all liability, including but not limited to demands, claims, actions, fees, costs and expenses (including attorney and expert witness fees), arising from or connected with Contractor's operations or its services, which result from bodily injury, death, personal injury, or property damage (including damage to Contractor's property). Contractor shall not be obligated to indemnify for liability and expense ensuing from the active negligence of the County.

3.9 INSURANCE

3.9.1 General Insurance Requirements. Without limiting the Contractor's indemnification of the County and during the term of this Contract, the Contractor shall provide and maintain, and shall require all of its Subcontractors to maintain, the programs of

insurance specified in this Contract. Such insurance shall be primary to and not contributing with any other insurance or self-insurance programs maintained by the County, and such coverage shall be provided and maintained at the Contractor's own expense.

3.9.2 Evidence of Insurance. Certificate(s) or other evidence of coverage satisfactory to the County shall be delivered to the Department of Beaches and Harbors, Contract Section, 13837 Fiji Way, Marina del Rey CA 90292 prior to commencing services under this Contract. Such certificates or other evidence shall:

(1) Specifically identify this Contract;

(2) Clearly evidence all coverages required in this Contract;

(3) Contain the express condition that the County is to be given written notice by mail at least 30 days in advance of cancellation for all policies evidenced on the certificate of insurance;

(4) Include copies of the additional insured endorsement to the commercial general liability policy, adding the County of Los Angeles, its Special Districts, its officials, officers and employees as insureds for all activities arising from this Contract; and

(5) Identify any deductibles or self-insured retentions for County's approval. The County retains the right to require the Contractor to reduce or eliminate such deductibles or self-insured retentions as they apply to the County, or require the Contractor to provide a bond guaranteeing payment of all such retained losses and related costs, including, but not limited to, expenses or fees, or both, related to investigations, claims administrations and legal defense. Such bond shall be executed by a corporate surety licensed to transact business in the State of California.

3.9.3 Insurer Financial Rating. Insurance is to be provided by an insurance company acceptable to the County with an A.M. Best rating of not less than A:VII, unless otherwise approved by the County.

3.9.4 Failure to Maintain Coverage. Failure by the Contractor to maintain the required insurance or to provide evidence of insurance coverage acceptable to the County shall constitute a material breach of the Contract upon which the County may immediately terminate or suspend this Contract. The County, at its sole option, may obtain damages from the Contractor resulting from said breach. Alternatively, the County may purchase such required insurance coverage and, without further notice to the Contractor, the County may deduct from sums due to the Contractor any premium costs advanced by the County for such insurance.

3.9.5 Notification of Incidents, Claims or Suits. Contractor shall report to County:

(1) Any accident or incident related to services performed under this Contract which involves injury or property damage which may result in the filing of a claim or lawsuit against Contractor and/or County. Such report shall be made in writing within 24 hours of occurrence;

(2) Any third party claim or lawsuit filed against Contractor arising from or related to services performed by Contractor under this Contract;

(3) Any injury to a Contractor employee that occurs on County property. This report shall be submitted on a County "Non-employee Injury Report" to the County CA; and

(4) Any loss, disappearance, destruction, misuse, or theft of any kind whatsoever of County property, monies or securities entrusted to Contractor under the terms of this Contract.

3.9.6 Compensation for County Costs. In the event that Contractor fails to comply with any of the indemnification or insurance requirements of this Contract, and such failure to comply results in any costs to the County, Contractor shall pay full compensation for all costs incurred by the County.

3.9.7 Insurance Coverage Requirements for Subcontractors. Contractor shall ensure any and all Subcontractors performing services under this Contract meet insurance requirements of this Contract by either Contractor providing evidence to the CA of insurance covering the activities of Subcontractors, or Contractor providing evidence to the CA submitted by Subcontractors evidencing that Subcontractors maintain the required insurance coverage. The County

retains the right to obtain copies of evidence of Subcontractor insurance coverage at any time.

3.9.8 Insurance Coverage Requirements. The Contractor shall maintain the insurance coverages specified in this Section 3.9.8 in the amounts specified.

3.9.8.1 General liability insurance (written on ISO policy form CG 00 01 or its equivalent) with limits of not less than the following:

General Aggregate:	$2 million
Products/Completed Operations Aggregate:	$1 million
Personal & Advertising Injury:	$1 million
Each Occurrence:	$1 million

3.9.8.2 Automobile liability insurance (written on ISO policy form CA 00 01 or its equivalent) with a limit of liability of not less than $1 million for each accident. Such insurance shall include coverage for all "owned", "hired" and "non-owned" vehicles, or coverage for "any auto".

3.9.8.3 Workers' Compensation and Employers' Liability insurance providing Workers' Compensation benefits as required by the Labor Code of the State of California or by any other state, and for which Contractor is responsible. If Contractor's employees will be engaged in maritime employment, coverage shall provide workers compensation benefits as required by the U.S. Longshore and Harbor Workers' Compensation Act, Jones Act or any other federal law for which Contractor is responsible. In all cases, the above insurance also shall include employers' liability coverage with limits of not less than the following:

Each Accident:	$1 million
Disease – policy limit:	$1 million
Disease – each employee:	$1 million

3.9.8.4 Professional Liability. Insurance covering liability arising from any error, omission, negligent or wrongful act of the Contractor, its officers or employees with limits of not less than $1 million per occurrence and $3 million aggregate. The coverage also shall provide an extended two-year reporting period commencing upon termination or cancellation of this Contract.

3.10 STATUS OF CONTRACTOR'S EMPLOYEES; INDEPENDENT STATUS OF CONTRACTOR

3.10.1 Contractor shall at all times be acting as an independent contractor. The Contract is not intended, and shall not be construed, to create the relationship of agent, servant, employee, partnership, joint venture or association as between the County and Contractor.

3.10.2 Contractor understands and agrees that all of Contractor's personnel who furnish services to the County under the Contract are employees solely of Contractor and not of County for purposes of Workers' Compensation liability.

3.10.3 Contractor shall bear the sole responsibility and liability for furnishing Workers' Compensation benefits to Contractor's personnel for injuries arising from or connected with the performance of the Contract.

3.11 RECORD RETENTION AND INSPECTION

3.11.1 The Contractor agrees that the County or any duly authorized representative shall have the right to examine, audit, excerpt, copy or transcribe any transaction, activity, time card, cost accounting record, financial record, proprietary data or other record pertaining to the Contract. Contractor shall keep all such material for four years after the completion or termination of the Contract, or until all audits are complete, whichever is later.

3.11.2 If any such records are located outside the County of Los Angeles, the Contractor shall pay the County for travel and per diem costs connected with any inspection or audit.

3.12 AUDIT SETTLEMENT

3.12.1 If, at any time during the term of the Contract or at any time after the expiration or termination of the Contract, authorized representatives of the County conduct an audit of the Contractor regarding performance of the Contract and if such audit finds that the County's obligation for the Contract payment is less than the payments made by the County to the

Contractor, then the Contractor agrees that the difference shall be either paid forthwith by the Contractor, or at the Director's option, credited to the County against any future Contract payments.

3.12.1.1 If such audit finds that the County's obligation for the Contract payment is more than the payments made by the County to the Contractor, then the difference shall be paid to the Contractor by the County, provided that in no event shall the County's maximum obligation under the Contract exceed the funds appropriated by the County for the purpose of the Contract.

3.13 VALIDITY. The invalidity in whole or in part of any provision of the Contract shall not void or affect the validity of any other provision.

3.14 WAIVER. No waiver of a breach of any provision of the Contract by either party shall constitute a waiver of any other breach of the provision. Failure of either party to enforce a provision of the Contract at any time, or from time to time, shall not be construed as a waiver of the provision or any other provision. The Contract remedies shall be cumulative and additional to any other remedies in law or in equity.

3.15 DISCLOSURE OF INFORMATION

3.15.1 The Contractor shall not disclose any details in connection with the Contract or any work performed under the Contract to any third party, except as may be required by law or as expressly authorized in writing by the Director.

3.15.2 However, recognizing the Contractor's need to identify its services and clients, the Contractor may publicize the Contract work, subject to the following limitations:

(1) All publicity shall be presented in a professional manner.

(2) The name of the County shall not be used in commercial advertisements, press releases, opinions or featured articles, without the prior written consent of the Director. The County shall not unreasonably withhold written consent, and approval by the County shall be deemed to have been given in the absence of objection by the County within two (2) weeks after receipt by the CA of the material submitted by the Contractor for approval by the County.

(3) The Contractor may list the County in any other proposal submitted in response to a request for proposals or bids from a third party without prior written permission of the County.

3.16 COUNTY'S REMEDIES FOR DEFAULT

3.16.1 If the Contractor fails to perform the Contract work in accordance with the covenants, terms and conditions of the Contract or fails to comply with any other material covenant, term or condition of the Contract, the County may, by written notice of default to the Contractor, terminate the whole or any part of the Contract. Nothing in this Section 3.16 shall prevent the County from recovering any and all damages arising from the default. The County may elect not to terminate the Contract without waiving its right to such recovery.

3.16.2 Contractor shall have ten (10) calendar days from written notification of default in which to cure the default. The County, in its sole discretion, may by written notice allow a longer or additional period for cure.

3.16.3 If the Contractor does not cure the default within the time specified by the notice of default or written extension of time, the Contract shall be terminated. In such event, all finished or unfinished documents, data and reports prepared by the Contractor under this Contract shall be transferred immediately to the County.

3.16.4 In the event the County terminates the Contract in whole or in part for the Contractor's default, the County may procure replacement services from a third party or by County's employees upon such terms and in such manner as the County deems appropriate. The Contractor shall be liable to the County for any excess costs arising from the use of replacement services. Excess costs shall consist of those costs incurred by the County in procuring replacement services, which exceed the costs the County would have been obligated to pay the Contractor for the services in question. The Contractor shall continue performance of any part of the Contract work not terminated.

3.16.5 Except with respect to defaults of Subcontractors, the Contractor shall not be liable for any excess costs if the failure to perform arises out of causes beyond the control and without the fault or negligence of the Contractor. Such causes may include, but are not restricted to, acts of the public enemy, acts of the County in either its sovereign or contractual capacity, acts of the federal and state governments in their sovereign capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargos, and unusually severe weather. If the failure to perform is caused by the default of a Subcontractor arising from causes beyond the control of both Contractor and Subcontractor, and without the negligence of either of them, the Contractor shall not be liable for any excess costs for failure to perform unless the Contractor had sufficient time to obtain performance from another party.

3.16.6 If, after termination, it is determined that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the Contract were terminated pursuant to Section 3.18 (Termination for Convenience of the County).

3.16.7 The rights and remedies of the County provided in this section shall not be exclusive and are in addition to any other rights and remedies provided by law or under the Contract.

3.17 DEFAULT FOR INSOLVENCY

3.17.1 Notwithstanding the provisions of Section 3.16, the County may cancel the Contract for default without giving the Contractor written notice of default and time to cure upon the occurrence of any of the following events:

(1) The Contractor becomes insolvent. The Contractor shall be deemed to be insolvent if it has ceased to pay its debts in the ordinary course of business or cannot pay its debts as they become due, whether it has committed an act of bankruptcy or not, whether it has filed for federal bankruptcy protection and whether it is insolvent within the meaning of the federal bankruptcy law.

(2) The filing of a voluntary petition to have the Contractor declared bankrupt.

(3) The appointment of a receiver or trustee for the Contractor.

(4) The execution of the Contractor of an assignment of the Contract for the benefit of creditors.

3.17.2 The rights and remedies of the County provided in this section shall not be exclusive and are in addition to any rights and remedies provided by law or under the Contract.

3.18 TERMINATION FOR CONVENIENCE OF THE COUNTY

3.18.1 The performance of the Contract work may be terminated in whole or in part from time to time when such action is deemed by the County to be in its best interest, subject to delivery to the Contractor of a ten (10) day advance notice of termination specifying the extent to which the Contract work is terminated, and the date upon which such termination becomes effective. After receipt of a notice of suspension of performance or termination, the Contractor shall stop the Contract work on the date and to the extent specified in the notice.

3.18.2 County may suspend performance or terminate the Contract without liability for damages if County is prevented from performing by reasons beyond its control, including but not limited to operation of laws, acts of God, and official acts of local, state, or federal authorities.

3.18.3 The County and Contractor shall negotiate an equitable amount to be paid the Contractor by reason of the total or partial termination of work pursuant to this section, which amount may include a reasonable allowance for profit on the Contract work that has been performed and has not been paid, provided that such amount shall not exceed the total obligation to pay for the Contract work performed as reduced by the amount of Contract payments otherwise made.

3.18.4 The Contractor shall make available to the County, for a period of four (4) years after Contract termination, at all reasonable times, at the office of the Contractor, all books, records, documents, or other evidence bearing on the costs and expenses of the Contractor in respect to the termination under this section of the Contract work. In the event records are located outside the County of Los Angeles, the Contractor will pay the County for traveling and

per diem costs connected with the inspection or audit.

3.19 NOTICE OF DELAY. Except as otherwise provided, when either party knows of any fact that will prevent timely performance of the Contract, that party shall give notice, including all relevant information, to the other party within five days.

3.20 NOTIFICATION. Except as otherwise provided by the Contract, notices desired or required to be given by law or under the Contract may, at the option of the party giving notice, be given by enclosing a written notice in a sealed envelope addressed to the party for whom intended and by depositing such envelope with postage prepaid in the United States mail. Any such notice shall be addressed to the Contractor at the address shown for the Contractor in the Proposal or such other place designated in writing by the Contractor. Notice to the County shall be addressed to the Director, Department of Beaches and Harbors, 13837 Fiji Way, Marina del Rey, California 90292, or such other place as the Director may designate in writing.

3.21 CONFLICT OF INTEREST

3.21.1 The Contractor represents and warrants the statements set forth in the conflict of interest certification of its Proposal are true and correct.

3.21.2 The Contractor further agrees that anyone who is an employee or former employee of the County at the time of execution of the Contract by the Board of Supervisors and who subsequently becomes affiliated with the Contractor in any capacity shall not perform the Contract work or share in the Contract's profits for a period of one (1) year from the date of termination of the employee's employment with the County.

3.21.3 The County shall have the right to terminate the Contract for a breach by the Contractor of either its warranty or promise on the absence of the prohibited conflicts of interest.

3.22 DELEGATION AND ASSIGNMENT

3.22.1 The Contractor may not delegate its duties or assign its rights under the Contract, either in whole or in part, without the written prior consent of the Director. Any delegation of duties or assignment of rights under the Contract without the expressed written consent of the County shall be null and void and shall constitute a breach for which the Contract may be terminated.

3.22.2 Any delegation of duties or assignment of rights (including but not limited to a merger, acquisition, asset sale and the like) shall be in the form of a subcontract or formal assignment, as applicable. The Contractor's request to the Director for approval of an assignment shall include all information that must be submitted with a request by the Contractor to the County for approval of a subcontract of the Contract work pursuant to Section 3.23.

3.23 SUBCONTRACTING

3.23.1 Performance of the Contract work may not be subcontracted without the express written consent of the Director or authorized representative. Any subcontract of the Contract work without the express written consent of the Director or authorized representative shall be null and void and shall constitute a breach for which the Contract may be terminated.

3.23.2 The Contractor's request to the Director for approval to enter into a subcontract of the Contract work shall include:

(1) A description of the work to be performed by the Subcontractor;

(2) Identification of the proposed Subcontractor and an explanation of why and how the proposed Subcontractor was selected, including the degree of competition in the selection process;

(3) The proposed subcontract amount, together with the Contractor's cost or price analysis; and

(4) A copy of the proposed subcontract.

3.23.3 In the event the Director or authorized representative should consent to a subcontract for the performance of the Contract work, the terms and conditions of the Contract shall be made expressly applicable to the work that is to be performed by the Subcontractor.

3.23.4 In the event the Director or authorized representative should consent to a subcontract,

the Contractor shall provide in the approved subcontract an agreement that the work of the Subcontractor is pursuant to the terms of a prime contract with the County of Los Angeles, and that all representations and warranties shall inure to the benefit of the County of Los Angeles.

3.23.5 Subcontracts shall be made in the name of the Contractor and shall not bind nor purport to bind the County. The making of subcontracts shall not relieve the Contractor from performing the Contract work in accordance with the terms and conditions of the Contract. Approval of any subcontract by the County shall not be construed as effecting any increase in the compensation to be paid for the Contract work.

3.23.6 Any later modification or amendment of the subcontract shall be approved in writing by the Director or authorized representative before such modification or amendment is effective.

3.24 CHANGES AND AMENDMENTS

3.24.1 Except as provided in this Section 3.24, renewals and other modifications of this Contract shall be in writing and shall be executed by the parties and approved by the Board in the same manner as the Contract.

3.24.2 A change which does not materially effect the scope of work, period of performance, compensation, method of payment, insurance or other material term or condition of the Contract shall be effective upon the Director or his authorized representative and the Contractor signing an amendment or other writing reflecting a modification of the Contract.

3.24.3 The Director or authorized representative may, in his or her sole discretion, grant the Contractor extensions of time for performance of the work where such extensions do not materially effect the work. Such extensions shall not be deemed to extend the term of the Contract.

3.25 PROPRIETARY RIGHTS. All materials, data and other information of any kind obtained from County personnel and all materials, data, reports and other information of any kind developed by the Contractor under the Contract are the property of the County, and the Contractor agrees to take all necessary measures to protect the security and confidentiality of all such materials, data, reports and information. The provisions of this paragraph shall survive the expiration or other termination of the Contract.

3.26 TIME. Except as specifically otherwise provided in the Contract, time is of the essence in the performance of the Contract work and all terms and conditions of the Contract with respect to such performance shall be construed.

3.27 AUTHORIZATION. The Contractor represents and warrants that its signatory to the Contract is fully authorized to obligate the Contractor for performance of the Contract work, and that all necessary acts to the execution of the Contract have been performed.

3.28 COMPLIANCE WITH COUNTY LOBBYING REQUIREMENTS

3.28.1 The Contractor and each County lobbyist or County lobbying firm, as defined in Los Angeles County Code Section 2.160.010, retained by the Contractor shall fully comply with the County Lobbyist Ordinance, Los Angeles County Code Chapter 2.160.

3.28.2 Failure on the part of the Contractor or any County lobbyist or County lobbying firm retained by the Contractor to fully comply with the County Lobbyist Ordinance shall constitute a material breach of the Contract upon which the County may immediately terminate or suspend the Contract notwithstanding the opportunity to cure otherwise made available under Section 3.16.

3.29 CONSIDERATION OF HIRING COUNTY EMPLOYEES ON A REEMPLOYMENT LIST OR TARGETED FOR LAYOFFS

Should the Contractor require additional or replacement personnel after the effective date of this Contract to perform the services set forth herein, the Contractor shall give first consideration for such employment openings to qualified permanent County employees who are targeted for layoff or qualified former County employees who are on a reemployment list during the life of this agreement.

3.30 CONSIDERATION OF GREATER AVENUES FOR INDEPENDENCE (GAIN) OR GENERAL RELIEF OPPORTUNITIES FOR

WORK (GROW) PARTICIPANTS FOR EMPLOYMENT

Should the Contractor require additional or replacement personnel after the effective date of the agreement, contractor shall give consideration for any such employment openings to participants in the County's Department of Public Social Services' Greater Avenues for Independence (GAIN) Program or General Relief Opportunities for Work (GROW) Program who meet Contractor's minimum qualifications for the open position. County will refer GAIN/GROW participants, by job category, to Contractor.

3.31 COUNTY'S CHILD SUPPORT COMPLIANCE PROGRAM

3.31.1 Contractor's Warranty of Adherence to County Child Support Compliance Program. Contractor acknowledges that County has established a goal of ensuring that all individuals who benefit financially from County through contract are in compliance with their court-ordered child, family and spousal support obligations in order to mitigate the economic burden otherwise imposed upon County and its taxpayers.

As required by the County's Child Support Compliance Program (County Code Chapter 2.200) and without limiting the Contractor's duty under this Contract to comply with all applicable provisions of law, Contractor warrants that it is now in compliance and shall during the term of this Contract maintain compliance with employment and wage reporting requirements as required by the Federal Social Security Act (41 USC Section 653a) and California Unemployment Insurance Wage and Earnings Withholding Orders or Child Support Services Department Notices of Wage and Earnings Assignment for Child or Spousal Support, pursuant to Code of Civil Procedure Section 706.031 and Family Code Section 5246(b).

3.31.2 Termination for Breach of Warranty to Maintain Compliance with County Child Support Compliance Program. Failure of Contractor to maintain compliance with the requirements set forth in the preceding Section 3.31.1 "Contractor's Warranty of Adherence to County's Child Support Compliance Program" shall constitute a default by Contractor under this Contract. Without limiting the rights and remedies available to County under any other provision of this Contract, failure to cure such default within 90 days of notice by the Los Angeles County Child Support Services Department shall be grounds upon which the County Board of Supervisors may terminate this Contract pursuant to Section 3.16 "County's Remedies for Default."

3.31.3 Voluntary Posting of "Delinquent Parents" Poster. Contractor acknowledges that County places a high priority on the enforcement of child support laws and apprehension of child support evaders. Contractor understands that it is County's policy to encourage all County contractors to voluntarily post County's "L.A.'s Most Wanted: Delinquent Parents" poster in a prominent position at Contractor's place of business. County Child Support Services Department will supply Contractor with the poster to be used.

3.32 CONTRACTOR'S CHARITABLE ACTIVITIES COMPLIANCE

3.32.1 The Supervision of Trustees and Fundraisers for Charitable Purposes Act regulates entities receiving or raising charitable contributions. The "Nonprofit Integrity Act of 2004" (SB 1262, Chapter 919) increased Charitable Purposes Act requirements. By requiring Contractors to complete the certification Form, the County seeks to ensure that all County contractors which receive or raise charitable contributions comply with California law in order to protect the County and its taxpayers. A contractor which receives or raises charitable contributions without complying with its obligations under California law commits a material breach subjecting it to either contract termination or debarment proceedings or both. (County Code Chapter 2.202)

3.33 CONTRACTOR RESPONSIBILITY AND DEBARMENT

3.33.1 A responsible Contractor is a Contractor who has demonstrated the attribute of trustworthiness, as well as quality, fitness, capacity and experience to satisfactorily perform the Contract. It is the County's policy to conduct business only with responsible Contractors.

3.33.2 The Contractor is hereby notified that, in accordance with Chapter 2.202 of the County

Code, if the County acquires information concerning the performance of the Contractor on this or other contracts which indicates that the Contractor is not responsible, the County may, in addition to other remedies provided in the Contract, debar the Contractor from bidding on County contracts for a specified period of time which generally will not exceed five years, but may exceed five years or be permanent if warranted by the circumstances, and terminate any or all existing contracts the Contractor may have with the County.

3.33.3 The County may debar a contractor if the Board of Supervisors finds, in its discretion, that the Contractor has done any of the following: (1) violated any term of a contract with the County or a nonprofit corporation created by the County; (2) committed any act or omission which negatively reflects on the Contractor's quality, fitness, or capacity to perform a contract with the County or any other public entity, or a nonprofit corporation created by the County, or engaged in a pattern or practice which negatively reflects on same, (3) committed an act or offense which indicates a lack of business integrity or business honesty, or (4) made or submitted a false claim against the County or any other public entity.

3.33.4 If there is evidence that the Contractor may be subject to debarment, the Department will notify the Contractor in writing of the evidence which is the basis for the proposed debarment and will advise the Contractor of the scheduled date for a debarment hearing before the Contractor Hearing Board.

3.33.5 The Contractor Hearing Board will conduct a hearing where evidence on the proposed debarment is presented. The Contractor and/or the Contractor's representative shall be given an opportunity to submit evidence at that hearing. After the hearing, the Contractor Hearing Board shall prepare a tentative proposed decision, which shall contain a recommendation regarding whether the Contractor should be debarred, and, if so, the appropriate length of time of the debarment. The Contractor and the Department shall be provided an opportunity to object to the tentative proposed decision prior to its presentation to the Board of Supervisors.

3.33.6 After consideration of any objections, or if no objections are submitted, a record of the hearing, the proposed decision and any other recommendation of the Contractor Hearing Board shall be presented to the Board of Supervisors. The Board of Supervisors shall have the right to modify, deny or adopt the proposed decision and recommendation of the Hearing Board.

3.33.7 If a Contractor has been debarred for a period longer than five years, that Contractor may, after the debarment has been in effect for at least five years, submit a written request for review of the debarment determinations to reduce the period of debarment or terminate the debarment. The County may, in its sole discretion, reduce the period of debarment or terminate the debarment if it finds that the Contractor has adequately demonstrated one or more of the following: (1) elimination of the grounds for which the debarment was imposed; (2) a bona fide change in ownership or management; (3) material evidence discovered after debarment was imposed; or (4) an other reason that is in the best interest of the County.

3.33.8 The Contractor Hearing Board will consider a request for review of debarment determination only where (1) the Contractor has been debarred for a period longer than five years; (2) the debarment has been in effect for at least five years; and (3) the request is in writing, states one or more of the grounds for reduction of the debarment period or termination of the debarment, and includes supporting documentation. Upon receiving an appropriate request the Contractor Hearing Board will provide notice of the hearing on the request. At the hearing, the Contractor Hearing Board shall conduct a hearing where evidence on the proposed reduction of debarment period or termination of debarment is presented. This hearing shall be conducted and the request for review decided by the Contractor Hearing Board pursuant to the same procedures as for a debarment hearing. The Contractor Hearing Board's proposed decision shall contain a recommendation on the request to reduce the period of debarment or terminate the debarment. The Contractor Hearing Board shall present its proposed decision and recommendation to the Board of Supervisors. The Board of Supervisors shall have the right to modify, deny, or adopt the processed decision and recommendation of the Contractor Hearing Board.

3.339 These terms shall also apply to Subcontractors of County Contractors.

3.34 NOTICE TO EMPLOYEES REGARDING THE FEDERAL EARNED INCOME TAX CREDIT. Contractor shall notify its employees, and shall require each Subcontractor to notify its employees, that they may be eligible for the federal Earned Income Tax Credit under the federal income tax laws. Such notice shall be provided in accordance with the requirements set forth in Internal Revenue Service Notice 1015.

3.35 CONTRACTOR TO USE RECYCLED PAPER. Consistent with the Board of Supervisors' policy to reduce the amount of solid waste deposited at the County landfills, the Contractor agrees to use recycled-content paper to the maximum extent possible on all work performed under this Contract.

3.36 COMPLIANCE WITH JURY SERVICE PROGRAM

3.36.1 Jury Service Program. This Contract is subject to the provisions of the County's ordinance entitled Contractor Employee Jury Service ("Jury Service Program") as codified in Sections 2.203.010 through 2.203.090 of the Los Angeles County Code.

3.36.2 Written Employee Jury Service Program.

3.36.2.1 Unless Contractor has demonstrated to the County's satisfaction either that Contractor is not a "Contractor" as defined under the Jury Service Program (Section 2.203.020 of the County Code) or that the Contractor qualifies for an exception to the Jury Service Program (Section 2.203.070 of the County Code), Contractor shall have and adhere to a written policy that provides that its employees shall receive from the Contractor, on an annual basis, no less than five days regular pay for actual jury service. The policy may provide that employees deposit any fees received for such jury service with the Contractor or that the Contractor deduct from the employee's regular pay the fees received for jury service.

3.36.2.2 For purposes of this section, "Contractor" means a person, partnership, corporation, or other entity which has a contract with the County or a subcontract with a County contractor and has received or will receive an aggregate sum of $50,000 or more in any 12-month period under one or more County contracts or subcontracts. "Employee" means any California resident who is a full time employee of Contractor. "Full time means 40 hours or more worked per week, or a lesser number of hours if: 1) the lesser number is a recognized industry standard as determined by the County, or 2) Contractor has a long-standing practice that defines the lesser number of hours as full time. Full-time employees providing short-term, temporary services of 90 days or less within a 12-month period are not considered full time for purposes of the Jury Service Program. If Contractor uses any Subcontractor to perform services for the County under this Contract, the Subcontractor shall also be subject to the provisions of this section. The provisions of this section shall be inserted into any such subcontract agreement and a copy of the Jury Service Program shall be attached to the agreement.

3.36.2.3 If Contractor is not required to comply with the Jury Service Program when the Contract commences, Contractor shall have a continuing obligation to review the applicability of its "exception status" from the Jury Service Program, and Contractor shall immediately notify County if Contractor at any time either comes within the Jury Service Program's definition of "Contractor" or if Contractor no longer qualifies for an exception to the Program. In either event, Contractor shall immediately implement a written policy consistent with the Jury Service Program. The County may also require, at any time during the Contract and at its sole discretion, that Contractor demonstrate to the County's satisfaction that Contractor either continues to remain outside of the Jury Service Program's definition of "Contractor" and/or that Contractor continues to qualify for an exception to the Program.

3.36.2.4 Contractor's violation of this section of the Contract may constitute a material breach of the Contract. In the event of such material breach, County may, in its sole discretion, terminate the Contract and/or bar Contractor from the award of future County contracts for a period of time consistent with the seriousness of the breach.

3.37 SAFELY SURRENDERED BABY LAW

3.37.1 Notice to Employees Regarding the Safely Surrendered Baby Law. The Contractor shall notify and provide to its employees, and require each Subcontractor to notify and provide to its employees, a fact sheet regarding the Safely Surrendered Baby Law, its implementation in Los Angeles County, and where and how to safely surrender a baby. The fact sheet is set forth in Exhibit 10 of this Contract and is also available on the Internet at www.babysafela.org for printing purposes.

3.37.2 Contractor's Acknowledgment of County's Commitment to the Safely Surrendered Baby Law. The Contractor acknowledges that the County places high priority on the implementation of the Safely Surrendered Baby Law. The Contractor understands that it is the County's policy to encourage all County Contractors to voluntarily post the County's "Safely Surrendered Baby Law" poster in a prominent position at the Contractor's place of business. The Contractor will also encourage its Subcontractors, if any, to post this poster in a prominent position in the Subcontractor's place of business. The County's Department of Children and Family Services will supply the Contractor with the poster to be used.

3.38 NO PAYMENT FOR SERVICES PROVIDED FOLLOWING EXPIRATION/ TERMINATION OF A CONTRACT

Contractor shall have no claim against County for payment of money or reimbursement of any kind whatsoever for any service provided by Contractor after the expiration or other termination of this Contract. Should Contractor receive any such payment, it shall immediately notify County and shall immediately repay all such funds to County. Payment by County for services rendered after expiration/termination of this Contract shall not constitute a waiver of County's right to recover such payment from Contractor. This provision shall survive the expiration or other termination of this Contract.

IN WITNESS WHEREOF, the County has, by order of its Board of Supervisors, caused this Contract to be subscribed by the Chairman of said Board and attested by the Executive Officer thereof, and the Contractor, by its duly authorized representative, has executed the same, as of the day, month, and year set forth below.

Aquatic Bioassay and Consulting Laboratories, Inc.

By _____ for Tim W
Thomas Mikel, President

COUNTY OF LOS ANGELES

By _____
Chairman, Board of Supervisors

ATTEST:

SACHI A. HAMAI
Executive Officer-Clerk of
the Board of Supervisor

By _____
Deputy

APPROVED AS TO FORM:

RAYMOND G. FORTNER, JR.
County Counsel

By _____
Deputy

ATTACHMENT 2

Bid Detail Information

Bid Number : DBH-22
Bid Title : Marine Environment Monitoring and Analysis Services
Bid Type : Service
Department : Beaches and Harbors
Commodity : STORM WATER DISCHARGE TESTING SERVICES
Open Date : 12/20/2006
Closing Date : 1/23/2007 5:00 PM
Bid Amount : $ 167,000
Bid Download : Available
Bid Description : The Los Angeles County Department of Beaches and Harbors (Department) is seeking one or more qualified and experienced contractors to perform, analyze and report on sampling and testing of the water, fish and other animal life and sediment within the Marina del Rey Small Craft Harbor.

Proposals must be in the form described in the RFP. Selection of a contractor(s) will be based on the qualifications of the firms submitting proposals as well as their prices for performing the work. A Proposers' Conference will be held at 10:00 a.m. on Tuesday January 9, 2007 at the Chace Park Community Building, 13650 Mindanao Way, Marina del Rey. The deadline for submitting proposals will be 5:00 p.m., January 23 , 2007.

Contractors submitting proposals must have a minimum of five (5) years' experience in conducting marine water, fish and sediment sampling, testing and analysis projects. The contractor should also have a thorough knowledge of State and Federal environmental regulations and guidelines, as well as related marine water, fish and sediment testing protocols.

To receive a copy of the RFP, either telephone (310) 577-5736, send an e-mail with Marine Environment Monitoring and Analysis Services in the subject line to sorellana@bh.lacounty.gov, visit http://lacounty.info/doing_business/main_db.htm, or write:

Department of Beaches and Harbors
Marine Environment Monitoring and Analysis Services RFP
13837 Fiji Way
Marina del Rey, CA 90292
Fax: (310) 821-8155

The County reserves the right to cancel the RFP and to modify any and all terms and conditions of the RFP, including minimum requirements. For further information, call Susy Orellana at (310) 577-5736.

Contact Name : Susy Orellana
Contact Phone# : (310) 577-5736
Contact Email : sorellana@bh.lacounty.gov
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ATTACHMENT 3

MARINE ENVIRONMENT MONITORING AND ANALYSIS SERVICES
FIRM/ORGANIZATION INFORMATION

PROPOSER	Certified Local SBE	COMPOSITION	PARTNERS/ ASSOCIATE		MGRS		STAFF		TOTAL		
			M	F	M	F	M	F		M	F
Aquatic Bioassay & Consulting Laboratories, Inc.	N	Black/African American							0		
		Hispanic/Latino							0		
		Asian or Pacific Islander				1	1		2		
		Amer. Indian/Alaska Native							0		
		Filipino American					2		2		
		White	1		2	1	1	2	7		
		TOTALS	1	0	2	2	4	2	11	7	4
Weston Solutions	N	Black/African American			3	3	25	37	68		
		Hispanic/Latino			8	4	29	28	69		
		Asian or Pacific Islander			16	2	25	22	65		
		Amer. Indian/Alaska Native			4	1	9	3	17		
		Filipino American							0		
		White			446	89	451	383	1369		
		TOTALS	0	0	477	99	539	473	1588	1016	572
Dixon Marine Services, Inc.	N	Black/African American							0		
		Hispanic/Latino							0		
		Asian or Pacific Islander							0		
		Amer. Indian/Alaska Native							0		
		Filipino American							0		
		White	1	1			3	2	7		
		TOTALS	1	1	0	0	3	2	7	4	3

M = minority; W = women; D = disadvantaged; DV = disabled veterans

AQUATIC BIOASSAY & CONSULTING LABORATORIES

Proposal for:

Marine Environmental Monitoring & Analysis Services

AQUATIC BIOASSAY & CONSULTING LABORATORIES

29 N. Olive St.

Ventura, CA 93001

Phone: 805.643.5621

Fax: 805.643.2960

Email: sdj_aqua@pacbell.net

Presented to:

The County of Los Angeles

Department of Beaches and Harbors

January 2007

Department of Beaches & Harbors

DATE: January 23rd, 2007

TO: Department of Beaches and Harbors
13837 Fiji Way
Marina del Rey, CA 90292

FROM: Scott Johnson
Aquatic Bioassay & Consulting Laboratories
29 N. Olive St.
Ventura, CA 93001
805 643 5621 x11

AQUATIC BIOASSAY & CONSULTING LABORATORIES, INC.

RE: BID FOR MARINE ENVIRONMENT MONITORING AND ANALYSIS SERVICES RFP

Aquatic Bioassay and Consulting Laboratories (Aquatic Bioassay) is pleased to present this proposal to the Los Angeles County Department of Beaches and Harbors (Department), in response to your Invitation for Bid entitled "Marine Environment Monitoring and Analysis Services". Our team of scientists have provided these services to the Department since 1996. From the beginning we have provided the Department's management team with services that met or exceeded expectations by providing the highest quality, scientifically defensible data and assessments possible. All of these sevices have been provided in a manner that has been both timely and cost effective. In addition, we have provided expert consulting services to the Department on numerous occasions before staff members of the Los Angeles Regional Water Quality Control Board, to the Marina del Rey Jurisdictional Committee and Marina del Rey TMDL Bacteria and Toxics workgroups.

During the past 27 years, *Aquatic Bioassay* Scientists have successfully completed similar marine surveys for many southern and central California government agencies. Our marine monitoring capabilities are in compliance with the State Water Quality Control Board, US EPA Receiving Water Monitoring Programs and the Southern California Regional Monitoring Program Laboratory Protocols. We are active participants in Southern California Bight Regional Monitoring activities, currently conduct receiving water studies from San Luis Obisbo to San Diego and are responsible for one of the largest ongoing NPDES municipal monitoring programs in southern California. Our taxonimists are active participants in SCAMIT and have years of experience identifying nearshore marine organisms in southern California.

Our team includes Rich Gossett of CRG Marine Laboratories who will provide the water and sediment chemistry services. CRG brings a reputation for being the highest quality environmental chemistry laboratory in southern California and will provide ultra-low detection limits for each of the constituents they will be measuring. Our benthic infauna taxonomy team will include Tony Phillips (polycheates), Dean Pasko (crustaceans & other phyla), Kelvin Barwick (mollusks) and Megan Lilly (echinoderms), all members of the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT). Ichthyoplankton identifications will be provided by Melinda Sweeny of Normandeau Associates. Resumes and company profiles for each of our team members are provided following form P-2.

The *Aquatic Bioassay* Team has a reputation for being able to complete projects after others have failed. In short, we will provide monitoring services that are cost

effective, meet or surpass all quality control guidelines, and provide a level of responsiveness that is totally unique to our industry.

Our bid includes:

- This cover letter
- Forms P-1 thru P-8, including more detailed information as follows:
  - Form P-1: we provide a detailed budget sheet
  - Form P-2: a detailed approach to work, staff qualifications & resumes
  - Form P-3: Aquatic Bioassay's Quality Assurance Project Plan for this project
  - Form P-4: Detailed project experience information

Please note that our price quote follows precisely the details provided in the RFP Scope of Work. During Aquatic Bioassay's successful performance on the Department's Marina del Rey Monitoring Program during the past 10 years, a few monitoring requirements have been modified, such as the total number of stations for water quality, benthic infauna and chemistry. If Aquatic Bioassay is awarded this contract, we can help the Department decide whether you would like to continue with these modifications. If so, we will adjust our pricing accordingly. In addition, the current program is based on a monitoring design that was developed over 20 years ago. In some cases the recommended sampling frequencies and measurements for the Department's montoring program have changed during that time. The Aquatic Bioassay team of scientists would be pleased to discuss with you how the monitoring program could modified to reduce costs and improve the quality of data that is collected.

We believe that after you review these materials, you will agree that Aquatic Bioassay is the best candidate to provide the monitoring services that you have requested. If you have any questions regarding our proposal, please feel free to contact me directly. We look forward to the prospect of working with your organization in the near future.

Sincerely,

Scott C. Johnson
Director of Environmental Programs
Aquatic Bioassay and Consulting Laboratories
805 643 5621 x11
scj_aqua@pacbell.net

REQUEST FOR PROPOSALS - MARINE ENVIRONMENT MONITORING AND ANALYSIS SERVICES
OFFER TO PERFORM and PRICE PROPOSAL

OFFER TO PERFORM

Proposer: **Name** Aquatic Bioassay and Consulting, Inc.

Address 29 N. Olive St.
Ventura, CA 93001

Phone 805-643-5621 **Fax** 805-643-2930

To: Director, Department of Beaches and Harbors

The Proposer responding to the Request for Proposals (RFP) issued by the Los Angeles County Department of Beaches and Harbors offers to perform, analyze and report on sampling and testing of the water, fish and other animal life and sediment within the Marina del Rey Small Craft Harbor at the indicated locations to be performed from the date of Board approval to June 30, 2010. In addition, at the option of the Director the term may be extended for two additional, consecutive, optional Contract Years. The two one-year options shall be exercised separately in succession.

Compensation for the Proposer's services shall be in accordance with the hourly rates set forth for such work on page 2, subject to the limitations provided in the Contract. The proposal is subject to the following additional conditions:

_____

_____

(Conditions that reject, limit or modify required terms and conditions of the Contract may cause rejection.)

This offer shall be irrevocable for a period of 120 days after the final date for submission.

Proposer is a(n): Individual (Corporation) Partnership or Joint Venture
Limited Liability Corporation Other: _____

State of organization: California Corporation Principal place of business: Ventura, California

Out of state vendor's authorized agent for service of process in California:

Name_____ Address_____ Phone_____

The Proposer represents that the person executing this offer and the following persons are individually authorized to commit the Proposer in any matter pertaining to the proposed Contract:

Name	Title	Phone	Name	Title	Phone
Scott Johnson	Dir. of Env. Programs	805.643.5621	Michael Machuzak	Asst. Lab Director	805.643.5621

Date: 1/22/07 Proposer's signature: _____

Thomas (Tim) Mikel President 805.643.5621
Name Title Phone

Please See Attached Pages.

PRICE PROPOSAL

Fill in all of the unshaded boxes.

- The price proposal will be used for rating and billing (invoice) purposes. Because the County may require increases or decreases in Marine Environment Monitoring services during the term of the Contract, the actual annual compensation may vary from the price quotation. Any additional hours of operation will be compensated at the quoted hourly rates. Any decreases in the hours of operation will result in a corresponding decrease in compensation based on the quoted hourly rates.
- The first three columns should reflect the title, hourly rate and total number of hours to complete the task as required/detailed by the Contract/Statement of Work.
  - No minimum hourly requirement is given for the position of Contractor Representative (See Contract section 2.2.1, Contractor's Representative) , but the cost for providing these services should be factored into the contractor's overhead costs.
- The last row ("TOTAL Annual Cost to the County Per Contract year") will be used for Proposal Price evaluation purposes. The total should equal the Proposer's expected compensation for providing the services as required by the Contract for Marine Environment Monitoring and Analysis as detailed in the Statement of Work and the corresponding Exhibits.

PRICE PROPOSAL

The cost of providing all contractual services and support staff, as well as overhead, materials, subcontractors, equipment purchase/rental, risk items or any other expenses to provide this service should be reflected in the quoted hourly rates for the positions identified below.

Job Title/Position	Hourly Rate	Total Proposed Hours - Annual	Total Annual Cost per Position
Task 1: Monthly Water Quality Monitoring:			
	$		$
	$		$
	$		$
	$		$
Task 2: Semiannual Fish Surveys:			
	$		$
	$		$
	$		$
	$		$
Task 3: Annual Sediment Chemistry Surveys:			
	$		$
	$		$
	$		$
	$		$
Task 4: Annual Report:			
	$		$
	$		$
TOTAL (ANNUAL COST TO COUNTY) PER CONTRACT YEAR			$

PRICE PROPOSAL

Job Title/Position	Hourly Rate	Total Proposed Hours - Annual	Total Annual Cost per Position
Task 1: Monthtthly Water Quality Monitoring:			
Project Manager	$125	40	$5,000
Senior Biologist	$100	80	$8,000
Supervising Biologist	$80	200	$16,000
Biologist	$70	262	$18,340
Field Technician	$50	281	$14,050
Task 2: Semiannual Fish Surveys:			
Project Manager	$125	14	$1,750
Senior Biologist	$100	25	$2,500
Supervising Biologist	$80	85	$6,800
Biologist	$70	85	$5,950
Field Technician	$50	85	$4,250
Task 3: Annual Sediment Chemistry Surveys:			
Project Manager	$125	25	$3,125
Senior Biologist	$100	45	$4,500
Supervising Biologist	$80	140	$11,200
Biologist	$70	145	$10,150
Field Technician	$50	150	$7,500
Task 4: Annual Report:			
Project Manager	$125	20	$2,500
Senior Biologist	$100	31	$3,100
Supervising Biologist	$80	33	$2,640
TOTAL (ANNUAL COST TO COUNTY) PER CONTRACT YEAR			**$127,355**

WORK PLAN

1. **STAFFING PLAN:** Provide the requested information about key employees and subconsultants. Attach each person's resume.

Name	Relationship to Proposer	Job Title	Responsibilities
Tim Mikel	Business Owner	President / Owner	Consulting, report review, expert witness
Scott Johnson	Employee	Project Manager / Senior Scientist	Technical management, reporting, review
Karin Wisniewski	Employee	Supervising Biologist	QC officer, data management, field ops
James Mann	Employee	Biologist	Field operations, data synthesis

2. **PRINCIPAL OWNER(S) OF PROPOSER'S ORGANIZATION:** Mr. Tim Mikel

3. **IDENTIFY PARTNERS/SUBCONSULTANTS:**

Principal	Firm Name	Relationship to Proposer	Specialty	Address	Phone
Rich Gossett	CRG Labs	Consultant	Chemistry	2020 Del Amo, Torrance, CA	310 320 4964
Tony Phillips		Consultant	Infauna	12122 Pasro Bonito, Los Alamitos CA	714 397 0014
Dean Pasko		Consultant	Infauna	643 Granados, Solana Beach, CA	858 792 9522
Kelvin Barwick		Consultant	Infauna	6134 Carling Wy, San Diego, CA	619 583 6582
Megan Lilly		Consultant	Infauna	2392 Kincaid Rd, San Diego, CA	619 758 2336
Melinda Swirny Normandeau		Consultant	Ichthyoplankton	141 Falmouth Heights Falmouth, MA	508 548 0700

4. **LICENSES:** List staff who hold licenses or registration required by California state law or relevant to performance of the work:

Name	License	License Number
Kann Wisenbaker	CA Dept of Fish & Game	SC-002968
John Gelsinger (Boat Captain)	CA Dept of Fish & Game	SC-004903
Jim Mann	CA Dept of Fish & Game	SC-007583
Scott Johnson	CA Dept of Fish & Game	SC-006527

5. **STATEMENT OF APPROACH TO THE SCOPE OF WORK.** (See Attached Responses)

Please attach a complete description of the approach your firm will take with respect to the Scope of Work identified in the RFP. Please be sure to address the following items:

a. How the Proposer will perform the Contract work. A narrative discussion of the Proposer's approach to the various kinds of marine environment monitoring assignments and County requirements;

b. Proposer's ability and resources to provide the kinds of marine environment monitoring services described in Attachment A, Part Two, Statement of Work;

c. How the experience of Proposer's staff is specifically related to the services described in Attachment A, Part Two, Statement of Work;

d. What level of staff the Proposer would assign to provide the various kinds of services listed in Attachment A, Part Two, Statement of Work;

e. Proposer's ability to support the Department before the Board of Supervisors, Small Craft Harbor Commission, Design Control Board, California Coastal Commission, and other bodies;

f. Proposer's ability to serve as an expert witness in court and arbitration proceedings;

g. Proposer's quality control plan describing the Proposer's procedures for ensuring compliance with the Contract terms and conditions and identifying and preventing unsatisfactory performance of the Contract work; and

h. Resumes of the firm's principal(s), proposed Contractor's Representative (as that position is defined in Attachment A, Part Two, Statement of Work,) and other key individuals on Proposer's staff (as listed on Form P-1), stating their professional training and specific related experience in the last five years.

8. **ADDITIONAL INFORMATION (Attach pages if necessary):**

2. Work Plan (Form P-2)

The following describes the approach Aquatic Bioassay and Consulting Laboratories has taken during the past ten years to help the Los Angeles Department of Beaches and Habors fulfill their monitoring requirements for Marina del Rey. These monitoring programs are specified in the Scope of Work identified in the RFP.

- ***Project Staff & Experience***

Here we present brief bios for each of the key members of our team who will be assigned to the Marina del Rey Environmental Monitoring Program. Each of these team members have worked extensively on the LA Department of Beaches and Harbor's Marina del Rey program. This is the same team who have provided monthly water quality, semiannual fish surveys, annual sediment surveys and annual reporting services for this project. Full resumes for each of our team members follows Form P-2. The following are the key team members:

Mr. Thomas (Tim) Mikel is the owner and Director of Aquatic Bioassay and Consulting Laboratories. His 30 years of experience have included Laboratory Directorships of CRL Environmental, Jacobs Laboratory, and the Santa Barbara Underseas Foundation. He has also held Senior Marine Biologist positions for PJB Laboratories and the U.S. Department of the Interior. He designed the Ecological Restoration Project of Upper Newport Bay and was the Biological Coordinator of the Anacapa Island Underwater Nature Trail. Mr. Mikel has been Project Manager for scores of marine surveys in Central and Southern California. He is an active participant on the Steering Committee for the Southern California Regional Monitoring Program and is a key author on sections of the Coastal Ecology and Toxicity assessement chapters for this program. As such, he was part of the team that assisted in the development of the Benthic Response Index (BRI). Mr. Mikel recently has recently published two groundbreaking papers on invasive benthic infaunal species in California. Mr. Mikel holds Bachelor's and Master's degrees in Aquatic Biology from Moss Landing Marine Laboratories and University of California, Santa Barbara, respectively.

Mr. Scott Johnson is the Director of Environmental Programs at Aquatic Bioassay and will be the project manager for the LA Department of Beaches and Harbors. Mr. Johnson joined Aquatic Bioassay in 2001 and is responsible for all freshwater bioassessment and marine monitoring programs. He currently manages the bioassessment and marine monitoring programs for the the Los Angeles Department of Beaches and Harbors, City of Oxnard, the Goleta Sanitation Districts. the Ventura County Watershed Districts, Santa Ana Regional Board, and the City of San Buenaventura, to name a few. Mr. Johnson was with the City of Los Angeles from 1984 to 1994, where he Managed the Environmental Monitoring Division's Biology Laboratories. He joined EcoAnalysis, Inc., an environmental analysis and database company in 1994 and advanced to President in 1998. Mr. Johnson is currently a Board member for the Southern California SETAC chapter, on the Technical Advisory Committee for the Southern California Stormwater Monitoring Coilition and was chairperson of the Southern California Toxicity Assessment Group Policy Committee between 1992 and 1995. He has numerous scientific papers and presentations to his credit. Mr. Johnson holds both Masters (1988) and Bachelors degrees (1981) in Biology (minor in Chemistry) from California State University, Long Beach and studied Limnology at the University of Uppsala, Sweden from 1978 to 1979.

Mr. Rich Gossett, Laboratory Director of CRG Laboratories has been in this field for 26 years and has 45 peer-reviewed scientific publications. Prior to CRG, Mr. Gossett served as Manager of the Organic Chemistry Laboratory at Southern California Coastal Water Research Project (SCCWRP) for 15 years and as Supervisor of the Orange County Sanitation Districts' (OCSD) Environmental Science Laboratory for 4½ years. Opened in 1995, CRG Laboratories, Inc. (ELAP Cert.#2261) analyzes water, sediment, tissue and aerial deposition samples from the marine,

stormwater/riverine and wastewater environments for the four priority pollutant groups of Trace Organic Compounds using only Gas Chromatograph/Mass Spectrometry (GCMS), Trace Metals using only Inductively Coupled Plasma/Mass Spectrometry (ICPMS), Microbiological Indicators using Multiple Tube Fermentation (MTF), Membrane Filtration (MF) and Colilert/Enterolert methods, and General Parameters using Ion Chromatography. Our techniques are the results of years leading research using EPA Methods, Standard Methods for the Examination of Water and Wastewater, Good Laboratory Practices and clean laboratories. The results to you are solutions to:

- "Ultra-low" Method Detection Limits (MDL) for most Constituents of Concern.
- Organic Metals Analysis.
- Trace Metals Analysis of Saline waters.
- Microbial Source Tracking Isolation and UV Disinfection Validation using Bacteriophage

Benthic Infaunal Analysis: Aquatic Bioassay brings several of the leading marine taxonomists in southern California to the Marina del Rey project. Our team has identified infaunal organisms for our clients from the Mexican Boarder to Pt. Conception, in coastal waters, bays, harbors and estuaries. Our team includes **Mr. Tony Phillips** (polychaetes), **Dean Pasko** (crustaceans & other phyla), **Kelvin Barwick** (mollusks) and **Megan Lilly** (echinoderms). They are all active SCAMIT members and have been identifying coastal benthic infaunal species in their respective areas of expertise for over ten years each.

Ms. Karin Wisenbaker is our supervising biologist who is responsible for the day to day operations of the taxonomy lab and biological field crews. Ms. Wisenbaker has been with Aquatic Bioassay since 2001 and participates in all dive survey work, data management, sample tracking, report writing and supervision of our taxonomy laboratory. Before coming to Aquatic Bioassay, Ms. Wisenbaker worked as the Environmental Projects Coordinator for the Southern California Marine Institute (SCMI) for seven years. She is proficient using the California Stream Bioassessment Protocols and has attended the workshops presented by the California Department of Fish and Game. Ms. Wisenbaker holds a Bachelors degree (2000) in Environmental Biology from California State University, Northridge.

Ms. Melinda Sweeny with Normandeau Associates, will provide ichthyoplankton identification services has a wide range of interests and experience in marine biology including benthic ecology, ichthyology, and marine mammology. Her experience includes quantitative fish and marine invertebrate collection, water quality data collection, identification of benthic and ichthyoplanktonic organisms, and marine mammal physiology as well as data analysis, statistical analysis, and technical writing.

Mr. James Mann is our biologist responsible for all field activities pertaining to dive surveys, water quality monitoring, equipment inventory and maintenance and the hazardous waste bioassay laboratory. Mr. Mann has been with Aquatic Bioassay for 12 years and conducts all underwater biological surveys for plants, fish and invertebrates; field water quality surveys using remote sensing equipment; and, Title 22 hazardous waste bioassays. He is proficient using the California Stream Bioassessment Protocols and has attended the workshops presented by the California Department of Fish and Game. Mr. Mann has been certified by the California Department of Fish and Game to conduct underwater surveys for *Caulerpa taxifolia* (expiration December 1st, 2006) and is proficient in the use of underwater photography equipment including video. Mr. Mann attended Antelope Valley College (1982 to 1984) and California State University, Northridge (1984 to 1989).

- **Staffing Levels for Unanticipated Emergencies and Ability to Provide Consulting Support**

All of the staff mentioned above will provide services on this project. Our team has successfully conducted this monitoring program during the past ten years. As such they will continue to provide

water quality, chemistry and fish population services as the Department deems necessary. If the Department decides to include special studies for bioaccumulation, toxicity testing or anyother special study related to marine or stormwater surveys in the future, our team of scientists will seamlessly implement these programs.

Our team of scientists are routinely asked to attend professional meetings in support of our clients. For the Department of Beaches and Harbors we have assisted on the Marina del Rey TMDL for Bacteria as part of the Compliance Monitoring Program (CMP) Technical Advisory Committee and the Marina del Rey Juridictional Committee has asked us to attend several meetings for technical support.

Our lead scientists are currently involved on the following committees and Professional Groups in southern California, to name a few:

- The Southern California Bight Regional Monitoring Program Technical Advisory Committees for:
  - Water Quality
  - Fish
  - Coastal Ecology
  - Environmental Database Management
- The Southern California Stormwater Monitoring Coalition Technical Advisory Committee
- The Southern California Association of Marine Invertebrate Taxonomists
- Board Members for the Society of Environmental Toxicology and Chemistry (SETAC)

As a result our team will be able to assist the Department with support before management committees and as expert witnesses in court and/or arbitration proceedings.

- ***Ability to Provide Services***

Aquatic Bioassay's Biologists and Oceanographers have been successfully performing the Marina del Rey Environmental Monitoring Program for the Los Angeles Department of Beaches and Harbors since 1996. Our Team has a reputation for being able to complete projects after others have failed. In short, we will provide monitoring or toxicity testing services that are cost effective, meet or surpass all quality control guidelines, and provide a level of responsiveness that is totally unique to our industry.

During the past 26 years, *Aquatic Bioassay* Scientists have completed marine surveys for many southern and central California industries and municipalities. Our marine monitoring capabilities are in compliance with either State Water Quality Control Board or US EPA Receiving Water Monitoring Programs. We are active participants in Southern California Bight Regional Monitoring activities, currently conduct receiving water studies from San Luis Obisbo to San Diego and are responsible for one of the largest ongoing NPDES municipal monitoring programs in southern California. Our field and laboratory capabilities include sampling and analysis for icthyoplankton, water quality, current meter studies, sediment chemistry, benthic infauna, tissue bioaccumulation, trawled organisms, particle size, bacteria and more. For each program we provide all services

pertaining to monitoring design, sample collection, data management and analysis, and reports ready for submittal to local, state and federal agencies.

Aquatic Bioassay's laboratory is fully equipped to perform all marine and freshwater acute or chronic toxicity tests on hazardous wastes, wastewater, drilling fluids, or benthic sediments in compliance with NPDES, ASTM, USEPA/COE, or DOHS regulations. With over 160 bioassay clients in California and other states, we are one of the most successful bioassay laboratories on the West Coast.

Aquatic Bioassay occupies a 5000 square-foot building in Ventura, California. The facility is divided into three bioassay incubator rooms, a bioassay laboratory, a marine monitoring laboratory, and a video microscopy laboratory.

Marine Incubator Room. *Aquatic Bioassay* supports three bioassay incubator rooms maintained at 15, 20, and 25 deg C. The coldest incubator is used for conducting most marine acute and chronic bioassays. This room houses a 500 gallon seawater holding tank, 0.2 micron ocean water filtration system, and three 50 gallon holding aquaria for a number of marine species. Tests include acute bioassays (crangon shrimp, speckled sanddabs, rainbow trout, and three-spine sticklebacks), chronic bioassays (sea urchin fertilization, abalone and bivalve larval development, topsmelt and mysid shrimp survival and growth, and kelp spore germination and growth), and sediment and drill mud bioassays using amphipods, clams, and polychaete worms.

Acute Freshwater Incubator Room. The 20 deg C room is used for acute bioassays (DOHS, Title 22) and fresh-water NPDES wastewater bioassays using fathead minnows.

Chronic Freshwater Incubator Room. The 25 deg C room is used for freshwater chronic bioassays, including the fathead minnow larval survival and growth test, the water flea (*Ceriodaphnia*) survival and reproduction bioassay, and the *Selenastrum* algae growth test. The marine silversides minnow survival and growth test is also conducted in this incubator.

Bioassay Laboratory. This laboratory houses instruments and supplies needed for counting and weighing all freshwater and marine chronic species. Equipment includes light tables, a Coulter Counter, analytical balances, water baths, drying ovens, and a deionized water system with a final bank of water polishing cartridges.

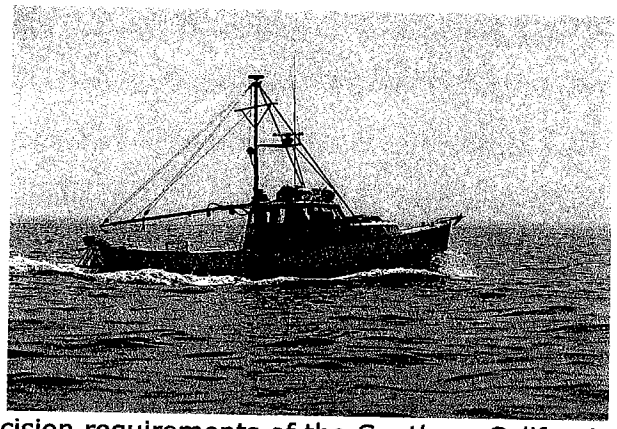
Microbiology Laboratory. This laboratory houses the instruments and supplies needed for conducting chromogenic substrate (Enterolert: coliform, E. coli, enterococcus) and multiple tube fermentation analyses (total and fecal coliforms, and enterococcus bacteria).

Marine and Freshwater Taxonomy Laboratory. This monitoring laboratory is designed for the evaluation of ocean and freshwater, sediments, and biota. Equipment includes dissecting and compound microscopes, light tables, digital cameras with microscope mounts, teaching microscopes and a complete taxononomic library for the identification of marine infauna, macrobenthic invertebrates, larval and adult fishes, pelagic invertebrates, algae; freshwater insects, algae, and fishes; and, terrestrial plants.

Particle Size Analysis Laboratory. This laboratory houses a laser diffraction Horiba 920 Particle Size Analyzer. Particles ranging in size from ≤ 2000 μ to > 0.3 μ can be measured in soils, sediments or water samples in accordance with Standard Methods 20th ed., Section 2560-c and Procedures for Handling and Chemical Analysis of Sediment and Water Samples, R.H. Plumb, US EPA Contract 4805572010, May 1981.

Video Microscopy Laboratory. This laboratory is used for the counting and evaluation of most marine chronic bioassays. To improve accuracy, a bank of three inverted microscopes has been fitted with high resolution video cameras connected to video screens.

AQUATIC BIOASSAY SURVEY VESSEL AND FIELD EQUIPMENT



Aquatic Bioassay's field resources are some of the best in sourthern and central California. Our main survey vessel, the *Hey Jude*, is a 45-foot New England Trawler with booms and rigging designed for research surveys by Aquatic Bioassay biologists. In addition, we have a 15-foot *Zodiac* equipped with a 15 Hp outboard motor for surveys in bays, harbors, and estuaries. We are also equipped with an ROV for pipe and other remote video surveys. All field equipment satisfy the accuracy and precision requirements of the *Southern California Bight Regional Monitoring Program Operations Manual*.

The following lists our field equipment capabilities:

Program	Equipment
Positioning	• Satellite Geoglobal Positioning (DGPS) • Loran C, Radar, Fathometer
Water Quality	• SeaBird SBE-19 & SBE-25 Analyzers • Chelsea Transmissometer (25 cm) • NBS Thermometers • WETStar mini Fluorometer and CDOM • Secchi Disc • Niskin Collection Bottles • Enterolert Bacterial Analysis Kits and incubator • Multiple Tube Fermentation Supplies and incubator
Sediment Sampling	• 0.1 m^2 Van Veen Grabs (galvanized and stainless, • both single and dual deployment harnesses) • Ponar grab & Petite Ponar grab • Box Corer

	• Diver-Held Corers
Freshwater Sampling	• D-Kick nets (0.5 mm mesh net) • YSI Water Quality Meter (Temp, DO, pH, conductivity) • Velocity Meter • Canopy Densiometer • Inclinometer • Range Finder (laser) • Fish Siene
Trawl Sampling	• Marinovich Trawl Nets, 25-Foot Headrope
Ichthyoplankton Sampling	• Bongo nets, 0.333 μ net mesh • Neuston Net
Current Studies	• InterOcean S-4 Current Meters
Remotely Operated Vehicle (ROV)	• J.W. Fishers SeaLion
Particle Size Analysis	• Horiba 920 Laser Diffraction Particle Size Analyzer • Beckman Coulter Z1 Particle Counter
SCUBA Gear	• Video Equipment • Still Cameras

- ***Approach to the Scope of Work***

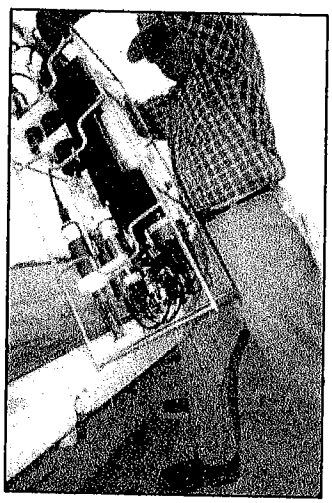
Sampling and data collection for water quality assessment will be conducted monthly at the 18 stations located throughout Marina del Rey and Oxford Lagoon. To help eliminate tidal effects on water quality measurements, monthly survey dates will be selected so that sampling can begin at high tide, with succeeding stations sampled on the falling tide. Except for the walk-in stations at Mothers' Beach (19) and Oxford Lagoon (13 and 22), all water quality sampling will be performed using a 14 foot AVON.

Water Quality Measurements

All water quality measurements will be collected according to protocols established for the Southern California Regional Monitoring Program (SCCWRP 2003) and by the Southern California Regional Water Quality Cooperative of which Aquatic Bioassay is a member.

CTD Casts, Secchi Disk and Forel Color

Temperature, conductivity (later converted to salinity), dissolved oxygen, pH, and light transmissance will be measured continuously through the water column using a SeaBird CTD Water Quality Analyzer (SBE 25) and associated Chelsea 25-cm Transmissometer. All probes will be calibrated immediately prior to each survey and immediately after the instruments are returned to the laboratory. CTD data will be converted to engineering units using SeaBird's DATConvert software, and then formatted for analysis using IGOD's Water Quality Software.



Measurements of light penetration will be assessed using a Secchi disk, and water color will be measured using a Forel-Ule scale.

Discrete water samples will be collected at the surface, then at 2 meter depths to the bottom at all stations using a Nauman sampler.

The Forel-Ule (FU) scale will be used to measure water color at each station and contain a series of small vials filled with various shades of colored liquid mimicking those typically observed for marine waters. These are compared to the seawater viewed above the white Secchi disk suspended beneath the water surface. Numbers 1-3 represent deep-sea blues, the clearest of oceanic waters. Numbers increase to the blue-greens (4-6), greens (7-9), yellow-greens (10-12), yellow-green-browns (13-15), yellow-browns (16-18), and brown-reds (19-20). It is not appropriate to use the FU scale in the shallow, muddy waters of Oxford Basin. Color estimates using the Forel-Ule scale are very subjective; the same person should perform the observations in all surveys. With this proviso, color estimates provide a good indication of events occurring in marine waters.

Light transmissance, surface transparency and water color measurements can not be taken within Oxford Basin (Stations 13 and 22) or at the Mother's Beach shoreline station (19) because of the shallowness of the water. Light transmissance data were converted to 0.1 meter path length to be comparable with past surveys.

Discrete Water Samples

Discrete water samples will be distributed into sterile 125-mL polypropylene bottles for bacterial analysis (total and fecal coliform; enterococcus bacteria), 250-mL polypropylene bottles containing sulfuric acid for ammonia analysis, and 300-mL dark glass BOD bottles for biochemical oxygen demand analysis. All water analyses will be performed in accordance with either *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, 20th Edition) or *Methods for the Chemical Analysis of Water and Wastes* (US EPA, revised March 1983, EPA/600/4-79/020) modified to accommodate the analysis of seawater. Aquatic Bioassay and Consulting Laboratories (29 N. Olive, Ventura, CA) is certified by both the State of California and the US EPA to perform these analyses.

Indicator Bacteria

All discrete water samples will be immediately placed in coolers containing blue ice and returned to Aquatic Bioassay and Consulting Laboratories. Immediately upon return, the bacteria samples will be set for total and fecal coliform and enterococcus bacteria via multiple-tube fermentation methods. Samples will be analyzed in accordance with *Standard Methods for the Examination of Water and Wastewater*, APHA, 20th Edition. For total and fecal coliform, sterile fermentation tubes containing lauryl tryptose broth will be inoculated with samples and incubated at 35 deg C. Gas production within 48 hours indicates a preliminary positive result. Small portions from the positive media tubes will be transferred to brilliant green bile and E.C. media tubes. Gas production in these confirms the presence of total and fecal coliform bacteria, respectively.

For enterococcus bacteria, sterile fermentation tubes containing azide dextrose broth will be inoculated with samples and incubated at 35 deg C. Evidence of turbidity within 48 hours indicates a preliminary positive result. Small portions from the positive media tubes will be streaked onto PSE agar plates. The plates will be inverted and incubated at 35 deg C. Any brownish-black colonies with brown halos are transferred to brain-heart infusion broth with 6.5% sodium chloride and incubated at 35 deg C with and without 6.5% sodium chloride and incubated at 45 deg C. Evidence of turbidity in both within 48 hours confirms the presence of enterococcus group bacteria. All bacterial densities will be determined as MPN per 100 mL of seawater sample.

Biological Oxygen Demand (BOD) & Ammonia

Biochemical oxygen demand (BOD) samples will be set immediately and placed into a specially designed airtight container. These samples are incubated for five days at 20° C. Oxygen is measured at the beginning and end of the test. Ammonia samples will be placed in a laboratory

refrigerator at 4 °C until analyzed. Ammonia will be analyzed by ion-selective electrode calibrated against known standards.

Survey reports containing a short narrative, along with tabular and graphical representations of the SeaBird 25 CTD data, water column chemistry, bacteria, and observational data, will be compiled and presented to the Department of Beaches and Harbors on a monthly basis throughout the survey year. The Annual Monitoring Report will summarize the data collected from these monthly water quality surveys and to assess the vertical, temporal, spatial and historic water quality trends in Marina del Rey Harbor.

Semiannual Fish Surveys

To ensure that fishes from all Marina habitats and life stages are sampled, five separate sampling techniques are employed: bottom trawling, beach seining, gill netting, visual transects by divers, and ichthyoplankton tows. Trawl sampling will be conducted during May and October of each year in accordance with the *Southern California Regional Monitoring Program, Trawl Field Guide* (2003), *Use of Small Otter Trawls in Coastal Biological Surveys* (EPA 1978), and *Quality Assurance and Quality Control (QA/QC) for 301(h) Monitoring Programs: Guidance on Field and Laboratory Methods* (1986).

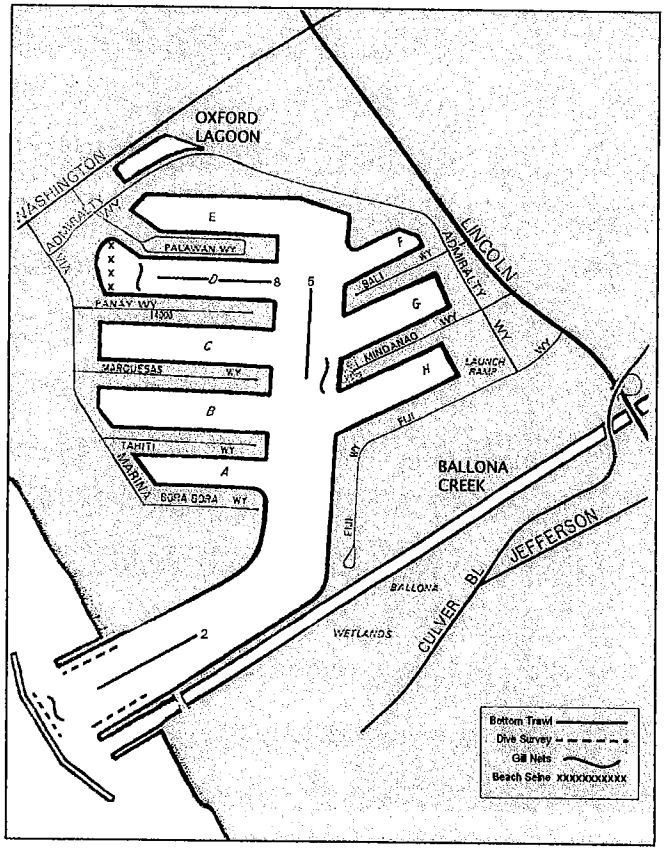
Bottom trawls will be conducted at three locations in the Marina (Stations 2, 5 and 8) using a standard, five-meter head rope length otter trawl (See Map Below). Replicate, five minute trawls will be performed at each station. Fishes are identified and enumerated. Data from replicate trawls will be combined for analysis and assessment. Once assessment of these data are completed, comparison of fish assemblages in the Marina with other harbors and marinas in southern California will be possible.

The beach seine surveys will be conducted at Marina Beach using a 100 ft (32.8 m) beach seine deployed at 2.5 m depth about 30 m from the beach and was fished to shore. Fishes will be identified, enumerated and then released.

A gill net will be deployed at three locations in the Marina: at Marina Beach, inside the entrance along the break wall, and between Basins G and H at the end of Mindanao Way. A 100 ft (32.8 m) multi-mesh gill net was set for two hours at each location.

Three visual dive transects will be conducted along the inside margins of the breakwater, and along the north and the south jetties at the entrance to the Marina. Each 100 meter long transect will be conducted by two divers who record the numbers and species of fishes they observed.

Fish eggs and larvae (ichthyoplankton) will be collected at Stations 2, 5, 8 using a 333 um mesh plankton net attached to a benthic sled. Tows will be conducted at 1.0 m depth for two minutes and just above the bottom for three minutes. For all groups of fishes; numbers of animals, numbers of species, and species diversity will be calculated.



Annual Sediment Surveys

Chemistry

Benthic grab sampling will be conducted from the monitoring vessel Hey Jude, in accordance with *Techniques for Sampling and Analyzing the Marine Macrobenthos* March 1978, EPA 600/3-78-030; *Quality Assurance and Quality Control (QA/QC) for 301 (h) Monitoring Programs: Guidance on Field and Laboratory Methods* May 1986, Tetra Tech; and the laboratory and field methods guides developed by the Southern California Regional Survey Committees (SCCWRP 1994, 1998, 2003).

Samples will be collected with a chain-rigged, tenth square-meter Van Veen Grab. At each station, the grab will be lowered rapidly through the water column until it was near the bottom, and then slowly lowered until contact is made. The grab will then be carefully raised until clear of the bottom. Once on board, the grab is drained of water using a siphon. Initial qualitative observations of color, odor, consistency, etc. are recorded. Sample acceptance is based on criteria specified in the Southern California Bight Regional Survey protocols (2003). Sediment samples collected at Stations 13 and 22, in Oxford Lagoon, are collected by hand using a clean plastic scoop.

Sediments to be analyzed for physical properties are removed from the top 2 cm of the sample and placed in clean plastic zip lock bags. These are analyzed for particle size distribution by laser diffraction using a Horiba particle size analyzer and in accordance with Procedures for Handling and Chemical Analysis of Sediment and Water Samples, R.H. Plumb, US EPA Contract 4805572010, May 1981. Each of two replicate sub-samples from each sediment sample were re-suspended in de-ionized water, and then injected into the analyzer. The analyzer is capable of measuring particle sizes ranging from clay (<2µm) through course sand (2000µm). Results were recorded as the percentage each size distribution represented of the whole.

Data for each station were reduced to the median (middle) particle size (in microns) and the sorting index. The sorting index ranges between sediments that have a very narrow distribution (very well sorted) to those which have a very wide distribution (extremely poorly sorted). This index is simply calculated as the 84^{th} percentile minus the 16^{th} percentile divided by two (Gray 1981). Well sorted sediments are homogeneous and are typical of high wave and current activity (high energy areas), whereas poorly sorted sediments are heterogeneous and are typical of low wave and current activity (low energy areas).

Sediment portions to be chemically analyzed were removed from the top two centimeters of the grab sample with a Teflon-coated spatula and placed in pre-cleaned glass bottles with Teflon-lined caps. Samples were immediately placed on ice and returned to the laboratory. CRG Marine Laboratories, Inc. in Torrance, California performed all chemical analyses. All parameters measured including the method detection limits, reporting limits, units and method are shown in the table below.

Parameter	Units	MDL	RL	Method
Non-Metallic Contaminants and Metals				
Total Volatile Solids	% Dry Wei	0.1	0.2	SM 2540-E
Immediate Oxygen Demand	mg/L	0.01	1	SM 4500-O G
Chemical Oxygen Demand	mg/kg	2	100	EPA 410.1M
Total Organic Carbon	%	0.01	0.03	EPA 9060A
Oil & Grease	Percent	2	10	EPA 1664
Orthophosphate PO4	mg/L	0.01	0.05	SM 4500-P C
Organic Nitrogen (TKN)	µg/dry g	1	10	EPA 351,3M
Acid Volatile Sulfides	mg/dry kg	0.05	0.1	Plumb, 1981 and TERL
Ammonia-N	mg/L	0.01	0.05	SM 4500-NH3 F
Arsenic (As)	µg/dry g	0.025	0.05	EPA 6020
Cadmium (Cd)	µg/dry g	0.025	0.05	EPA 6020
Chromium (Cr)	µg/dry g	0.025	0.05	EPA 6020
Copper (Cu)	µg/dry g	0.025	0.05	EPA 6020
Iron (Fe)	µg/dry g	1	5	EPA 6020
Lead (Pb)	µg/dry g	0.025	0.05	EPA 6020
Manganese (Mn)	µg/dry g	0.025	0.05	EPA 6020
Mercury (Hg)	µg/dry g	0.005	0.01	EPA 6020
Nickel (Ni)	µg/dry g	0.025	0.05	EPA 6020
Tributyltin	ng/dry g	1	3	Krone et al., 1989
Zinc (Zn)	µg/dry g	0.025	0.05	EPA 6020
LA County Stormwater Measurements				
Calcium (Ca)	µg/dry g	1	10	EPA 6020
Potassium	µg/dry g			EPA 6020
Sodium (Na)	µg/dry g	1	5	EPA 6020
Chloride	mg/L	0.01	0.05	SM 4500-Cl E
Barium (Ba)	µg/dry g	0.025	0.05	EPA 6020
Selenium (Se)	µg/dry g	0.025	0.05	EPA 6020
Silver (Ag)	µg/dry g	0.025	0.05	EPA 6020
Fluoride	mg/L	0.01	0.05	SM 4500-F D
Nitrate-N	mg/L	0.01	0.05	SM 4500-NO3
Nitrite-N	mg/L	0.01	0.05	SM 4500-NO2 B
Sulfate	mg/L	0.01	0.05	SM 4500-SO4 F
Total Alkalinity	mg/L	1	5	SM 2320 B
Total Hardness as CaCO3	mg/kg	1	5	SM 2340-B
Boron (B)	mg/L	0.025	0.05	EPA 6020
Conductivity	mS			SM 2510
Total Dissolved Solids	mg/L			SM 2450-C
Percent Solids = Total Sus Solids	Percent	0.1	0.1	EPA 160.3

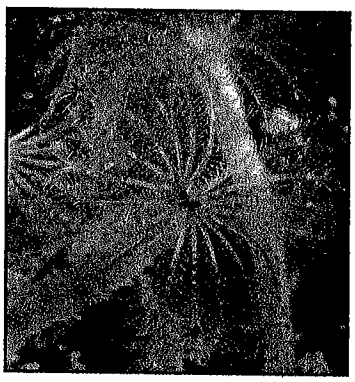
Parameter	Units	MDL	RL	Method
Pesticides and Chlorinated Hydrocarbons				
2,4'-DDD	ng/dry g	1	5	EPA 8270C
2,4'-DDE	ng/dry g	1	5	EPA 8270C
2,4'-DDT	ng/dry g	1	5	EPA 8270C
4,4'-DDD	ng/dry g	1	5	EPA 8270C
4,4'-DDE	ng/dry g	1	5	EPA 8270C
4,4'-DDT	ng/dry g	1	5	EPA 8270C
Total Detectable DDTs	ng/dry g			EPA 8270C
Aldrin	ng/dry g	1	5	EPA 8270C
BHC-alpha	ng/dry g	1	5	EPA 8270C
BHC-beta	ng/dry g	1	5	EPA 8270C
BHC-delta	ng/dry g	1	5	EPA 8270C
BHC-gamma	ng/dry g	1	5	EPA 8270C
Chlordane-alpha	ng/dry g	1	5	EPA 8270C
Chlordane-gamma	ng/dry g	1	5	EPA 8270C
Dieldrin	ng/dry g	1	5	EPA 8270C
Endosulfan Sulfate	ng/dry g	1	5	EPA 8270C
Endosulfan-I	ng/dry g	1	5	EPA 8270C
Endosulfan-II	ng/dry g	1	5	EPA 8270C
Endrin	ng/dry g	1	5	EPA 8270C
Endrin Aldehyde	ng/dry g	1	5	EPA 8270C
Endrin Ketone	ng/dry g	1	5	EPA 8270C
Heptachlor	ng/dry g	1	5	EPA 8270C
Heptachlor Epoxide	ng/dry g	1	5	EPA 8270C
Methoxychlor	ng/dry g	1	5	EPA 8270C
Mirex	ng/dry g	1	5	EPA 8270C
Toxaphene	ng/dry g	10	50	EPA 8270C
trans-Nonachlor	ng/dry g	1	5	EPA 8270C
Aroclor 1016	ng/dry g	10	20	EPA 8270C
Aroclor 1221	ng/dry g	10	20	EPA 8270C
Aroclor 1232	ng/dry g	10	20	EPA 8270C
Aroclor 1242	ng/dry g	10	20	EPA 8270C
Aroclor 1248	ng/dry g	10	20	EPA 8270C
Aroclor 1254	ng/dry g	10	20	EPA 8270C
Aroclor 1260	ng/dry g	10	20	EPA 8270C

Benthic Biota

Sampling for benthic infauna will be conducted from the Hey Jude during October of each year. Benthic grabs will be collected according the procedures established in:

- *Quality Assurance and Quality Control (QA/QC) for 301(h) Monitoring Programs: Guidance on Field and Laboratory Methods, EPA Contract No. 68-01-6938*
- *The Southern California Bight Regional Monitoring Program, 2003 Survey (SCCWRP 2002)*

Samples will be collected using a modified 0.1 m^2, Van Veen grab. Once on board, each grab is visually inspected for penetration depth, color, sediment composition and odor. All samples are screened using both 0.5 and 1.0 mm sieves. Infauna samples are covered with a relaxant ($MgSO_4$) for a half hour then transferred to 10% buffered formalin. After 48 hours the samples are transferred to 70% ethanol.



In the laboratory samples will sorted into major taxonomic groups (annelids, crustaceans, mollusks, echinoderms and other phyla). Vials containing sorted infauna are then identified to the lowest possible taxon by Mr. C.A. (Tony) Phillips of the City of Los

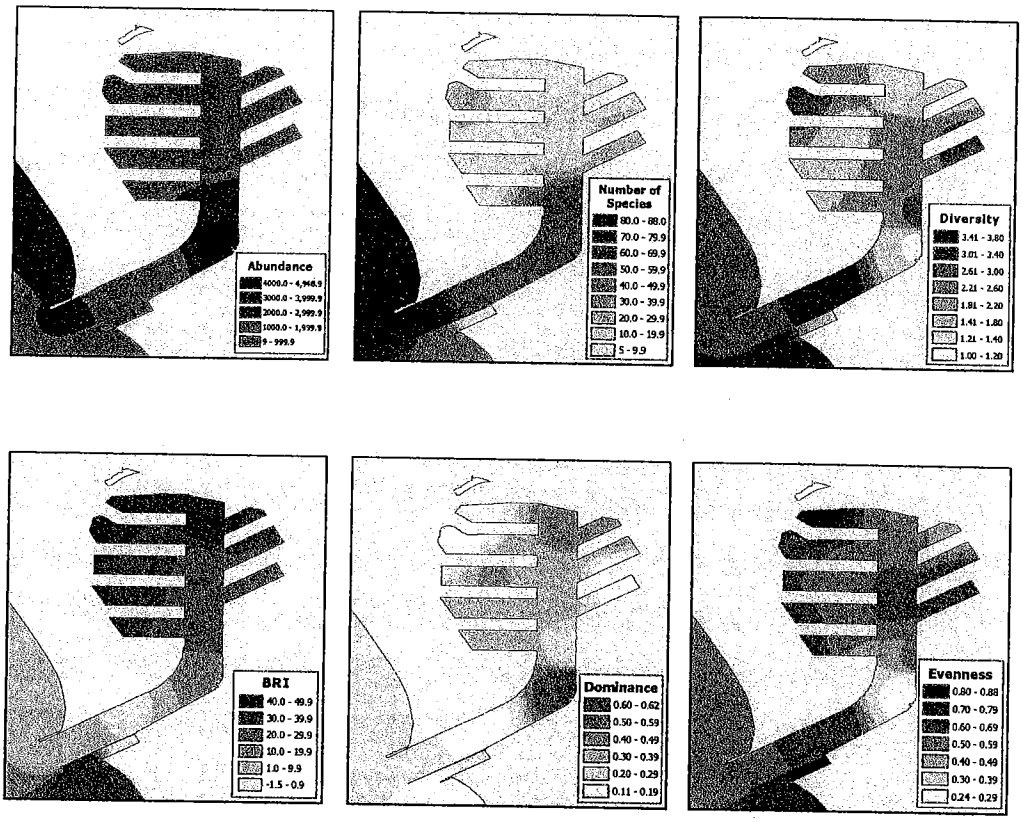
Angeles' Bureau of Sanitation. The taxa list and problem organisms were reviewed by C.A Phillips and presented to members of the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT) as necessary to ensure proper identification.

During the past ten years Aquatic Bioassay has done extensive statistical analyses of the sediment chemistry and infauna data sets. These techniques have included parametric statistics (t-test, ANOVA, correlation) and multivariate statistics (cluster analysis, PCA, ordination). These aseessments have helped the Department to make informed decisions regarding the environmental conditions in the Harbor. Below are presented graphics showing a few of these techniques.

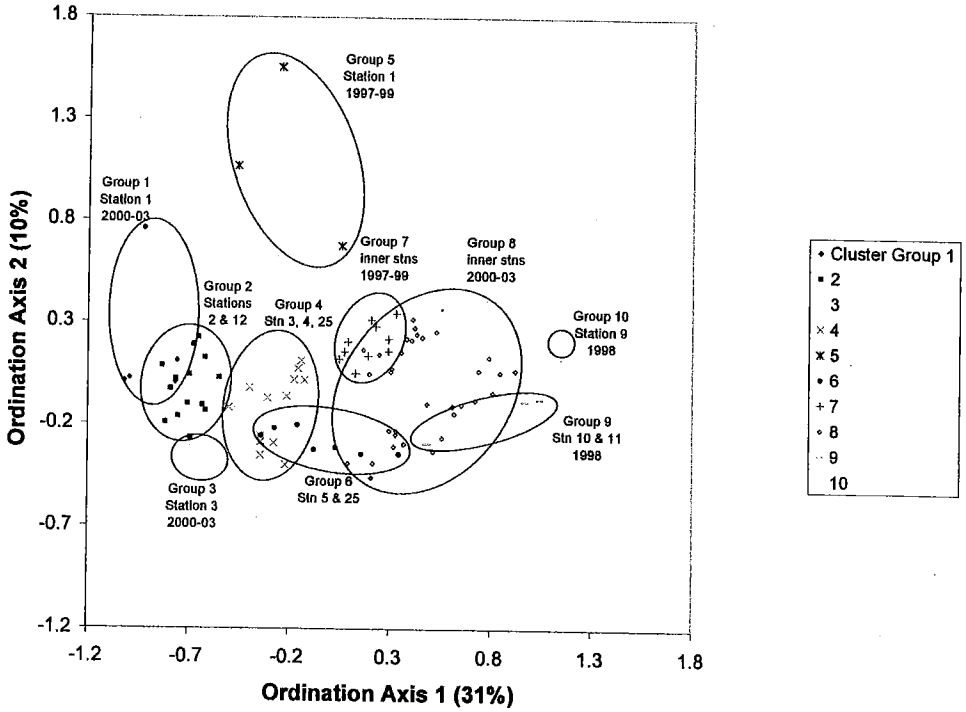
Table showing Marina del Rey benthic infauna population metrics grouped and averaged by cluster groups.

Station	Cluster Group	Total Abundance	# of Species	Shannon Wiener Diversity	Simpson Dominance	Evenness	BRI
12	1	9	5	1.43	0.28	0.89	-1.6
1	2	412	46	2.77	0.11	0.72	39.5
2	2	2034	88	2.44	0.24	0.54	7.0
	average	**1223**	**67**	**2.61**	**0.18**	**0.63**	**23.2**
3	3	648	54	2.61	0.18	0.65	0.8
4	3	4949	54	0.96	0.62	0.24	14.3
25	3	2257	59	2.07	0.22	0.51	25.1
	average	**2618**	**56**	**1.88**	**0.34**	**0.47**	**13.4**
7	4	405	22	2.10	0.15	0.68	27.4
8	4	743	25	2.18	0.17	0.68	45.9
9	4	612	16	1.29	0.44	0.47	37.3
11	4	213	10	1.19	0.45	0.52	49.9
	average	**493**	**18**	**1.69**	**0.30**	**0.58**	**40.1**
5	5	105	18	1.77	0.32	0.61	26.3
6	5	172	10	1.46	0.31	0.64	34.1
10	5	47	10	1.94	0.18	0.84	42.4
26	5	442	16	1.39	0.40	0.50	31.9
	average	**192**	**14**	**1.64**	**0.30**	**0.65**	**33.7**

Figure showing contoured benthic infauna metric results.



1997 - 2003 Infaunal Community Ordination Analysis



MR. THOMAS (TIM) MIKEL
Laboratory Director

MR. MIKEL IS OWNER AND LAB DIRECTOR OF AQUATIC BIOASSAY AND CONSULTING LABORATORIES IN VENTURA, CA. MR. MIKEL'S CAREER SPANS 36 YEARS AND INCLUDES WORK IN BOTH MARINE AND FRESHWATER ECOLOGY. HIS AREAS OF EXPERTISE INCLUDES INFAUNAL ECOLOGY AND TOXICITY OF BOTH HARBOR AND COASTAL BENTHOS, STATISTICAL EVALUATION OF ENVIRONMENTAL DATA, OCEANOGRAPHIC SAMPLING AND ANALYSIS, MARINE INVERTEBRATE TAXONOMY, ACUTE AND CHRONIC FRESHWATER AND MARINE BIOASSAYS INCLUDING METHODS DEVELOPMENT.

AQUATIC BIOASSAY & CONSULTING LABORATORIES, INC.

EMPLOYMENT HISTORY & EXPERIENCE:

AQUATIC BIOASSAY AND CONSULTING LABORATORIES
Laboratory Director (1988 to Present)

Responsible for the complete coordination of all chronic and acute, freshwater and marine bioassays; as well as all chemical, bacteriological and oceanographic studies at Aquatic Bioassay. Project manager and specialist in hazardous waste toxicology and testing. Experienced with regional, state, and federal environmental agencies. Specialist in statistical evaluation of environmental data. Joint Chair for Mollusk Section of 20th Edition of *Standard Methods*. Chair of Methods Committee for Southern California Toxicity Assessment Group (SCTAG). Co-chair of the 1998 Southern California Bight Pilot Project Toxiciy Committee. Co-chair of the 2003 Southern California Bight Pilot Project Trawl Committee. Board Member of Southern California Society of Environmental Toxicology and Chemistry.

CHEMICAL RESEARCH LABORATORIES
Laboratory Director (1985 to 1988)

Director of 35 scientists and staff of a complete environmental bioassay, chemistry, bacteriology, and ocean monitoring laboratory. Designer and author of several new bioassay techniques. Frequent guest speaker for numerous environmental health agencies. Project manager for City of Oxnard, Chevron USA, and THUMS Long Beach ocean monitoring projects.

JACOBS ENVIRONMENTAL
Laboratory Director (1976 to 1985)

Director of Jacobs Ventura environmental laboratory. Designer of the Ecological Restoration Project of Upper Newport Bay. Developed hazardous waste bioassay and chemical analysis laboratories at this location. Responsible for all freshwater and marine NPDES bioassays. Project manager of all receiving water monitoring projects.

VENTURA COLLEGE
Oceanography Instructor (1978 to 1979)

Instructor for physical, chemical, and biological oceanography.

SANTA BARBARA UNDERSEAS FOUNDATION
Assistant Director (1974 to 1975)

Chief marine biologist for the Anacapa Island Underwater Nature Trail in cooperation with the U.S. National Park Service.

MR. THOMAS (TIM) MIKEL
Laboratory Director

U.S. DEPARTMENT OF THE INTERIOR
Marine Biologist (1973 to 1974)

Chief marine biologist for intertidal surveys conducted near Big Sur, California. Served as chief biological consultant for team of professional archaeologists.

EDUCATION

M.A. 1975. Population and Aquatic Biology. University of California, Santa Barbara.

B.A. 1973. Marine Biology, Marine Chemistry. California State University, Moss Landing Marine Laboratories.

PRESENTATIONS

"Factors Affecting the Diversity of Benthic Infauna in Southern California Bays and Harbors." 2002. *California and the World Ocean '02*. American Society of Civil Engineers.

"The Relationship Between Individual and Taxa Counts of Benthic Infauna From Southern California Bight Harbors. 2002 Southern California Society of Environmental Toxicology and Chemistry, Annual Meeting.

"Diversity-Abundance Relationships in Benthic Habitats of the Southern California Bight." 2002. Southern California Academy of Sciences Annual Meeting.

"Benthic Sediment Surveys of Haiwee Reservoir." 2001 Southern California Society of Environmental Toxicology and Chemistry, Annual Meeting.

"Sediment Toxicity in the Southern California Bight Using Marine Amphipods." 2000. Southern California Society of Environmental Toxicology and Chemistry, Annual Meeting.

"Marine Chronic Toxicity: Test of Effluent Quality from an Orange County Wastewater Treatment Plant." 1996. Society of Environmental Toxicology and Chemistry (SETAC) Annual Meeting. Washington D.C. (with Tom Gerlinger).

Afternoon Session Chair. 1995. Southern California Toxicity Assessment Group (SCTAG), Annual Meeting and Toxicity Workshop.

Afternoon Session Chair. 1994. Southern California Toxicity Assessment Group (SCTAG), Annual Meeting and Statistics Workshop.

"Experiments with Organic Buffers and Pure Oxygen for Ammonia Conversion in Acute Municipal Wastewater Bioassays." 1993. Southern California Toxicity Assessment Group (SCTAG). Annual Meeting.

"Chronic Toxicity Tests Using *Ceriodaphnia dubia* and Interpretation of Test Results Using "Toxstat"." 1992. Santa Ana Regional Water Quality Control Board and University of California, Riverside Extension.

"An Aquatic Bioassay Primer." 1992. California Water Pollution Control Association.

"Toxicity Testing - Acute and Chronic Bioassays." 1991. California Water Pollution Control Association.

MR. THOMAS (TIM) MIKEL
Laboratory Director

"Chemical and Biological Analysis of Hazardous Waste." 1987. Hazardous Materials Conference. Ventura County Environmental Health Department.

"Sediment Bioassays Using Mysid Shrimp." 1985. 10th Annual Aquatic Toxicity Symposium. American Society for Testing and Materials (ASTM).

"Determination of Hazardous Waste by Biological and Chemical Methods." 1985. Hazardous Waste Compliance Workshop. Ventura County Environmental Health Department.

"Marine Wastewater Outfalls as Artificial Reefs." 1983. Third International Artificial Reef Conference.

AWARDS

American Men and Women in Science. 1986 to Present.

Who's Who in America. 1996 to Present.

University of California Research Grant. 1975.

PROFESSIONAL SOCIETIES

Southern California Academy of Sciences

Society of Environmental Toxicity and Chemistry. Board Member, Southern California Chapter.

Standard Methods, Joint Task Group Chair for 20th Edition (1996), Section 8610 - Molluscan Bioassays.

Southern California Bight Pilot Project 1998 and 2003: Steering, Coastal Ecology, Water Quality, Information Management, Benthic Macrofauna, Trawl, and Toxicity (Co-Chair) Committees.

Southern California Toxicology Assessment Group (SCTAG), Chair of the Methods Committee (since 1993).

Southern California Association of Marine Invertebrate Taxonomists (SCAMIT).

PUBLICATIONS

"The Prevalence of Non-Indigenous Species in Southern California Embayments and Their Effects on Benthic Macroinvertebrate Communities." 2005. *Biol. Invasions*. 7:679-686 (with D. Montagne, R. Velarde, J. Ranasinghe, S. Weisberg, R. Smith, and A. Dalkey).

"Factors Affecting the Diversity of Benthic Infauna in Southern California Bays and Harbors." 2005. In: *California and the World Ocean '02*. American Society of Civil Engineers.

"Southern California Bight 2003 Regional Monitoring Program: I. Sediment Toxicity" 2005. Southern California Coastal Water Research Project (with S.Bay, K. Schiff, S. Matheson, B. Hester, D. Young and D. Greenstein).

"Extending the Southern California Benthic Response Index to Assess Benthic Conditions in Bays." 2003. Southern California Coastal Water Research Project. Technical Report 410 (with D. Montagne, R. Velarde, J. Ranasinghe, S. Weisberg, R. Smith, and A. Dalkey).

MR. THOMAS (TIM) MIKEL
Laboratory Director

"Soft-Bottom Benthic Invertebrate Assemblages of the Southern California Bight" 2004. Southern California Coastal Water Research Project – Annual Report 2002 (with D. Montagne, R. Velarde, J. Ranasinghe, S. Weisberg, R. Smith, and A. Dalkey).

"Diversity-Abundance Relationships in Benthic Habitats of the Southern California Bight" 2003. Southern California Coastal Water Research Project – Annual Report 2002 (with D. Montagne, R. Velarde, J. Ranasinghe, S. Weisberg, R. Smith, and A. Dalkey).

"Southern California Bight 1998 Regional Monitoring Program: I. Executive Summary" 2003. Southern California Coastal Water Research Project (with J. Ranasinghe, D. Montagne, S. Weisberg, S. Bay, M. Allen, J. Noblet, and B. Jones).

"Southern California Bight 1998 Regional Monitoring Program: VII. Benthic Macrofauna" 2002. Southern California Coastal Water Research Project (with J. Ranasinghe, D. Montagne, R. Smith, S. Weisberg, D. Cadien, R. Velarde, and A. Dalkey).

"Southern California Bight 1998 Regional Monitoring Program: V. Demersal Fishes and Megabenthic Invertebrates" 2002. Southern California Coastal Water Research Project (with M. Allen, A. Groce, D. Diener, J. Brown, S. Steinert, G. Deets, J. Noblet, S. Moore, D. Diehl, E. Jarvis, V. Raco-Rands, C. Thomas, Y. Ralph, R. Gartman, D. Cadien, and S. Weisberg).

"Southern California Bight 1998 Regional Monitoring Program: IV. Sediment Toxicity" 2000. Southern California Coastal Water Research Project (with S.Bay, D. Lapota, J. Anderson, J. Armstrong, A. Jirik, and S. Asato).

"Southern California Bight 1998 Regional Monitoring Program. Water Quality" (in prep.) Southern California Coastal Water Research Project (with A. Steele, M. Mengle, A. Dalkey, T. Stebbins, and S. Weisberg).

"Southern California Marine Monitoring Standard Data Transfer Formats" 2000. Southern California Coastal Water Research Project (with L. Cooper, S. Weisberg, D. Montagne, S. Walther, K. Walker, J. Shisko, I. Lee, S. Moore, G. Ferreri, P. Smith, R. Fairey, S. Chang, A. Soof, C. Roberts, M. Mengel, R. Wang, F. Lecaro, M. Emanuel, D. O'Donahue, G. Alfonso, M. Kelly, S. Meyer, L. King, R. Gossett, and H. Ngyyen).

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"Marine Chronic Toxicity: Test of Effluent Quality from an Orange County Wastewater Treatment Plant." 1996. Society of Enironmental Toxicology and Chemistry (SETAC) Annual Meeting. Washington D.C. (with Tom Gerlinger).

"Drilling Fluid Bioassays Using Pacific Ocean Mysid Shrimp, Acanthomysis sculpta, a Preliminary Introduction." Aquatic Toxicology and Hazard Assessment: 10th Vol. ASTM STP 971. *American Society of Testing and Materials*. 1988 (with Michael Machuzak).

"The California Assessment Manual: Determination of Hazardous Wastes." 1985. California Water Pollution Control Federation Journal.

"Ecological Restoration Project of Upper Newport Bay." 1977. U.S. Environmental Protection Agency.

"Marine Wastewater Outfalls as Artificial Reefs." 1985. *Bulletin of Marine Sciences.*

SCOTT C. JOHNSON
Director of Environmental Programs

MR. JOHNSON IS DIRECTOR OF ENVIRONMENTAL PROGRAMS WITH AQUATIC BIOASSAY AND CONSULTING LABORATORIES IN VENTURA, CA. MR. JOHNSON'S CAREER SPANS 24 YEARS AND INCLUDES WORK IN BOTH MARINE AND FRESHWATER ECOLOGY. AT AQUATIC BIOASSAY HE IS RESPONSIBLE FOR BOTH THE FRESHWATER BIOASSESSMENT AND MARINE MONITORING PROGRAMS FOR CLIENTS WHO REPRESENT SOME OF THE LARGEST STATE AND MUNICIPAL AGENCIES IN SOUTHERN CALIFORNIA. HIS PRIMARY AREAS OF FOCUS INCLUDE FRESHWATER AND MARINE ECOLOGY, DATA ANALYSIS AND REPORTING, PROTOCOL DEVELOPMENT, ENVIRONMENTAL REGULATORY POLICY, PROJECT MANAGEMENT, AND DATA MANAGEMENT.

AQUATIC BIOASSAY & CONSULTING LABORATORIES, INC.

PROJECT EXPERIENCE:

Marine Monitoring – Mr. Johnson currently manages, analyzes and interprets data, and provides regulatory reporting for the marine monitoring programs for several central and southern California agencies including the Goleta Sanitary District, the Cities of Oxnard, San Luis Obispo, Santa Barbara, Montecito, Summerland, Avalon and Carpentaria, and the Los Angeles Department of Beaches and Harbors. These programs include sampling and analysis for ichthyoplankton, water quality, sediment chemistry and toxicity, bioaccumulation, trawled organisms, benthic infauna, and microbiology. Each of these programs requires project management, data management, statistical analysis and regulatory report generation. Mr. Johnson began his career with the City of Los Angeles where, over a ten year period, he participated in and eventually managed a staff of 35 personnel tasked with conducting the City's Santa Monica Bay Monitoring Program. Mr. Johnson is a member of SCAMIT who is charged with the standardization of naming conventions for southern California marine organisms.

Freshwater Bioassessment Monitoring – Mr. Johnson is responsible for bioassessment monitoring for three of southern California's largest ambient watershed monitoring programs and numerous NPDES point source discharge agencies. Some of these include the Ventura, Riverside and Malibu Watershed Protection Agencies, and the Cities of Ventura, Camarillo, Simi Valley, Moorepark and the Newhall Land and Farming Company. He is a member of the Southern California Stormwater Consortium's, Technical Advisory Committee who are tasked with ensuring that current State and Federal bioassessment protocols provide scientifically defensible data when used in urban southern California streams. Mr. Johnson is a Board member for the Southwest Association of Invertebrate Taxonomists (SAFIT) who is charged with the standardization of naming conventions for California freshwater organisms.

EMPLOYMENT HISTORY & EXPERIENCE:

Aquatic Bioassay & Consulting Laboratories, Ventura CA
Director of Environmental Programs – January 2002 to present

Mr. Johnson is responsible for all ocean and freshwater monitoring and laboratory operations, environmental assessments, reporting and consulting. He is responsible for the freshwater bioassessment and marine monitoring programs for some of the largest agencies in southern California including the County of Orange RDMD, the Los Angeles Department of Beaches and Harbors, the Ventura County Watershed District, the Santa

Ana Regional Water Quality Control Board, the State of California's Contaminated Sediments Task Force, the City of Oxnard, the Goleta Sanitary District, the City of Santa Barbara, the City of Avalon and the City of San Luis Obispo. Mr. Johnson ensures that all field and laboratory operations are conducted with strict adherence to the proper protocols and that all results and reports are provided to Aquatic Bioassay clients in an accurate and timely fashion.

eLabor, Camarillo, CA

Vice President, Professional Services - February 1999 to January 2002

As Vice President in charge of the Professional Services Division and reporting directly to the CEO, Mr. Johnson was responsible for a staff of 50 employees mandated with the implementation and support of a workforce data management product suite. His primary responsibilities included all divisional budgeting, P&L, human resources, strategic partners and customer relationships.

EcoAnalysis, Inc., Ojai, CA

President - 1996 to October 1998; Director February 1994 to 1996

EcoAnalysis specialized in information synthesis and the development of client server information management systems for the environmental industry. Mr. Johnson was promoted to President by the Board of Directors to guide a restructuring process in 1997 that included: defining the company vision, development of a detailed business plan that refocused the company and resulted in the development of 3 'core' software applications, expanded sales and marketing efforts nationwide, and initiated negotiations for partnerships/acquisitions with several large environmental engineering firms. As Director Mr. Johnson managed the development of several large, client-server database systems for federal, state and municipal agencies that were striving to meet EPA regulatory standards.

City of Los Angeles, Los Angeles, CA

Laboratory Manager - 1992 to 1994
Laboratory Supervisor - 1988 to 1992
Water Biologist - 1984 to 1988

As Laboratory Manager and Supervisor, Mr. Johnson was in charge of the City of Los Angeles' NPDES ocean monitoring program for Santa Monica Bay that included administration of the annual budget and management of 33 professional staff. Mr. Johnson was responsible for assuring the timely and accurate completion of all NPDES ocean monitoring programs and reporting including: bacteriology, benthic infauna and trawling, rig fishing, seafood consumption, water quality, chronic and acute bioassays and microlayer. As a Water Biologist, Mr. Johnson was in charge of the City's inland water NPDES permits on the Los Angeles River.

County Sanitation Districts of Los Angeles, Whittier, CA

Laboratory Technician - 1982 to 1984

As Laboratory Technician, Mr. Johnson participated in all facets of the Sanitation District's marine monitoring programs including benthic infauna, trawling, water quality, bacteriology, data entry and quality assurance.

EDUCATION

M.S. Biology, California State University, Long Beach - 1988
B.A. Biology, Minor Chemistry, California State University, Long Beach - 1981
Limnology Program, University of Uppsala, Sweden – 1978 to 1979

PROFESSIONAL AFFILIATIONS

- Board Member, Southwest Association of Invertebrate Taxonomists (SAFIT) (2006 to present)
- Southern California Storm Water Monitoring Coalition, Technical Advisory Committee
- Board Member, Southern California Chapter of the Society of Environmental Toxicologist and Chemists (SETAC) (2004 to 2006)
- Member Southern California Association of Marine Invertebrate Taxonomists (SCAMIT)
- Member Southern California Academy of Sciences (SCAS)
- Member Advancing the Science of Limnology and Oceanography (ASLO)
- Chairperson of the Southern California Toxicity Testing Association's Policy Committee (1990 to 1995)

PAPERS AND PRESENTATIONS

S.C. Johnson. 2005. Ventura river watershed benthic macroinvertebrate monitoring (2001 to 2004). California Aquatic Bioassessment Workshop meetings held November 1st and 2nd, 2005 at University of California Davis.

S.C. Johnson, K. Kratz, K. Wisenbaker, J. Mann. 2005. The application of stream bioassessments in watershed and point source regulatory programs. Presented at the Southern California Academy of Sciences, Loyola Marymount College, Los Angeles, CA. May, 2005.

S.C. Johnson. 2004. Case studies of two bioassessment programs conducted in southern California according to the California stream bioassessment protocols. California Water Environment Association meetings held March 11, 2004 in Santa Barbara, CA.

S.C. Johnson. 2003. Workshop covering the California stream bioassessment protocols. California Water Environment Association meetings held August, 2003 in Laughlin, NV.

S.C. Johnson. 2003. Results of the Los Angeles Contaminated Sediments Task Force, confined aquatic disposal site long-term monitoring program. Presented at Entech03, Hazmat West, Long Beach, CA. October 28-30, 2003.

S.C. Johnson and Tim Mikel. 2003. First year survey results of the Los Angeles Contaminated Sediments Task Force, confined aquatic disposal site long-term monitoring program. Presented at the Southern California Academy of Sciences, Northridge, CA. May 9-10, 2003.

S.C. Johnson, F. D'Ascencio, J Vasilik, D. Peterson. 1997. Controlling Pretreatment software products - a case study from the Passaic Valley Sewerage Commissioners, New Jersey. Presented at the Water Environment Federation's Conference: Computer Technologies for the Competitive Utility. Philadelphia, PA. June 15-18, 1997.

R. W. Smith, S. C. Johnson. 1995. Controlling error rates in whole effluent toxicity testing. Presented at the Society of Environmental Toxicology and Chemistry, Second World Conference. Vancouver, BC November, 1995.

B. B. Bernstein, R. Hoenicke, C. Tyrell. 1995. Developing regional monitoring and management programs. Presented by S. C. Johnson at the National Estuary Program Coastal Technology Conference—Saving Bays and Estuaries: Sharing Tactics, New Orleans, LA, 1995.

R. W. Smith and S. C. Johnson. 1994. Controlling precision in NPDES toxicity testing. Presented at the meetings of the Society of Environmental Toxicologists and Chemists, Denver, October, 1994 and at the Southern California Academy of Sciences Annual Meeting, Fullerton, CA, May, 1995.

D.L. Denton, G.L. Starrett, R.W. Smith, S.C. Johnson. 1994. Comparison of hypothesis testing to point estimate techniques for marine toxicity tests. Presented at the meetings of the Society of Environmental Toxicologists and Chemists, Denver, October, 1994.

S. C. Johnson. 1990. Monitoring the sea-surface microlayer: a new tool for detecting the effects of a deep water outfall on the water quality of Santa Monica Bay, California. Presented at the Water Pollution Control Federation, Washington, DC, October, 1990.

C. A. Martin, J. D. Beller, S. C. Johnson, and J. F. Shisko. 1989. Detection of temporal and spatial water quality trends in Santa Monica Bay, California, 1987 to 1988. In: Proceedings of Oceans 89, An international conference addressing methods for understanding the global ocean. Volume 2: Ocean Pollution. IEEE Pub. No. 89CH2780-5.

S.C. Johnson. 1988. Effects of the elimination of sewage sludge on the biota and sediments of the Santa Monica Bay. Presented at Los Angeles City Hall, June, 1988.

S.C. Johnson. 1988. Fecal pellets of temperate and tropical damselfishes (Pomacentridae): Point sources of ammonium and dissolved phosphate. Master thesis, California State University, Long Beach.

R.N. Bray, A. C. Miller, S. C. Johnson, P. R. Krause, D. L. Robertson, and A. M. Wescott. 1988. Ammonium excretion by macroinvertebrate and fishes on a subtidal rocky reef in southern California. Mar Bio 100:21-30.

S.C. Johnson. 1986. Trawled demersal fish and invertebrates from Santa Monica Bay. Presented at the Managing Inflows Symposium, November, 1986.

S.C. Johnson and J. Roney. 1986. Wastewater discharge in Santa Monica Bay: II. Assemblages of macro invertebrates and demersal fish. In: Managing Inflows to California's Bays and Estuaries. Proceedings of the symposium. The Bay Institute of San Francisco, Sausalito, CA.

S.C. Johnson. 1985. The flux of ammonium and dissolved phosphate from blacksmith (Chromis punctipinnis) fecal material. Presented at the Western Society of Naturalists meeting, December 1985.

Karin J. Wisenbaker
Biologist

MS. WISENBAKER IS A BIOLOGIST WITH AQUATIC BIOASSAY AND CONSULTING LABORATORIES IN VENTURA, CA. AT AQUATIC BIOASSAY SHE IS THE FIELD MANAGER OF BOTH THE FRESHWATER BIOASSESSMENT AND MARINE MONITORING PROGRAMS FOR CLIENTS WHO REPRESENT SOME OF THE LARGEST STATE AND MUNICIPAL AGENCIES IN SOUTHERN CALIFORNIA. HER PRIMARY AREAS OF FOCUS INCLUDE THE OPERATIONAL MANAGEMENT OF THE MARINE AND FRESHWATER TAXONOMIC LAB, SURVEY PROGRAMS, DATA MANAGEMENT AND REPORTING.

AQUATIC BIOASSAY & CONSULTING LABORATORIES, INC.

PROJECT EXPERIENCE:

Marine Monitoring – Ms. Wisenbaker is the field manager of the marine monitoring programs for several central and southern California agencies including the Goleta Sanitary District, the Cities of Oxnard, San Luis Obispo, Santa Barbara, Montecito, Summerland, Avalon and Carpentaria, and the Los Angeles Department of Beaches and Harbors. These programs include sampling and analysis for benthic infauna, ichthyoplankton, water quality, sediment chemistry and toxicity, bioaccumulation, trawled organisms, and microbiology. For each of these programs, Ms. Wisenbaker is responsible for equipment maintenance, field mobilization, and data management. Ms. Wisenbaker also manages Aquatic Bioassay's infauna sorting laboratory. Ms. Wisenbaker began her career with the Southern California Marine Institute where she was the Environmental Projects Coordinator.

Freshwater Bioassessment Monitoring – Ms. Wisenbaker is the field manager responsible for coordinating and mobilizing bioassessment monitoring for three of southern California's largest ambient watershed monitoring programs and numerous NPDES point source discharge agencies. Some of these include the County of Orange RDMD, San Gabriel River Regional Monitoring Program, Ventura Watershed Protection District, and the Malibu Watershed Protection Agencies, and the Cities of Ventura, Camarillo, Simi Valley, Moorepark and the Newhall Land and Farming Company. Ms. Wisenbaker attended the CSBP workshops presented by the California Department of Fish and Game.

EMPLOYMENT HISTORY & EXPERIENCE:

Aquatic Bioassay & Consulting Laboratories, Ventura CA
Marine Biologist – September 2002 to present

Ms. Wisenbaker is responsible mobilization and field sampling operations for all marine and freshwater monitoring programs, data management, and the supervision of the benthic macroinvertebrate sorting laboratory. Ms. Wisenbaker ensures all the field sampling gear is in good condition and that field and laboratory operations are conducted with strict adherence to the proper protocols.

Southern California Marine Institute, Terminal Island CA
Environmental Projects Coordinator – September 2001 to August 2002

As Environmental Projects Coordinator, Ms. Wisenbaker was a citizen water quality monitoring coordinator. Her responsibilities included water quality training, education, the development of quality assurance protocols, data management and report writing. Ms. Wisenbaker wrote and implemented grants for water quality studies and collected

and reported oceanographic data from volunteer observation ships for the National Oceanic & Atmospheric Administration.

Instructional Technician – March 1994 – August 2001

Ms. Wisenbaker provided onboard teaching to elementary through college age students onboard three scientific research vessels. As such she taught local marine flora and fauna and demonstrated the use of scientific gear including otter trawls, remote water quality sensing packages (CTD), van Veen grabs, and plankton nets. Additionally, Ms. Wisenbaker was an onboard technician during scientific cruises for academic and private institutions and was responsible for the maintenance of all on board scientific gear.

EDUCATION

B.S. Biology, California State University, Northridge - 2000

PROFESSIONAL AFFILIATIONS

- Southern California Chapter of the Society of Environmental Toxicologist and Chemists (SETAC)
- Member Southwest Association of Invertebrate Taxonomists
- Member Southern California Association of Marine Invertebrate Taxonomists (SCAMIT)
- Member Southern California Academy of Sciences (SCAS)

CURRICULUM VITAE

RICHARD GOSSETT
President and Laboratory Director, CRG Marine Laboratories, Inc.
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EMPLOYMENT HISTORY

CRG Marine Laboratories, Inc., Dec. 1995 to Present

Orange County Sanitation Districts (OCSD), Apr 1991 to Dec 1995

Southern California Coastal Water Research Project (SCCWRP), Jul 1977 to Apr 1991

EDUCATION

B.A. Biology, 1977- California State University, Long Beach

PRINCIPAL RESPONSIBILITY EXPERIENCE

At CRG, I am responsible for the management of all laboratory activities including supervision of laboratory staff, project management, quality control, methods development and laboratory certifications.

At OCSD, I was Supervisor of the Organic Chemistry Laboratory in the Environmental Science Laboratory where I updated the methods and instrumentation for the analysis of organic compounds in air, water, biosolids and marine sediments/tissues. I was responsible for the management and direction of 8 chemists, implementation and operation of the Laboratory Information Management System (LIMS), and Laboratory Coordinator for the EPA-sponsored Southern California regional marine monitoring program; also, monitoring of the plant for federal and state permit compliance using EPA 600, SW846, and South Coast Air Quality Management District methods. Duties included supervision, work assignment and coordination, project management, budgeting and purchasing of instrumentation and supplies, sample preparation and analysis, data validation, and report writing.

At SCCWRP, I was Manager of the Organic Chemistry Laboratory providing analytical support to geochemists, biochemists, toxicologists, biologists and oceanographers. I was responsible for researching the sources, fates and effects of organic pollutants to the local marine ecosystem. Duties included supervision of 4 chemists, instrumentation maintenance and repair, sample design and collection, methods development, project design, grant management, data interpretation, report writing, and communication and interaction with all levels of the organization.

RESEARCH PUBLICATIONS AND REPORTS

2004 Stormwater Monitoring Coalition (SMC) Laboratory Guidance Document. Gossett, Richard, D. Renfrew and K. Schiff. Southern California Coastal Water Research Project, Westminster, CA.

2003 Southern California Bight 1998 Regional Monitoring Program: VI. Sediment Chemistry. James A. Noblet, E.Y. Zeng, R. Baird, R.W. Gossett, R.J. Ozretich and C.R. Phillips. Southern California Coastal Water Research Project, Westminster, CA.

2003 **Making Performance-Based Chemistry Work: How We Created Comparable Data Among Seven Laboratories As Part Of A Southern California Regional Assessment.** Richard Gossett, Rodger Baird, Kimberly Christensen, and Stephen B. Weisberg. *Environmental Monitoring and Assessment/EMAP Symposium 2001: Coastal Monitoring Through Partnerships.* 15 pp.

2000 **Strategic Process Study: Final Effluent Characterization, Phase I.** Charles Phillips, Doug Deiner, and Richard Gossett. Report to Orange County Sanitation Districts. 71 pp.

2000 **Composition Characterization of Prehistoric Ceramics: A New Approach.** Douglas J. Kennett, Sachiko Sakai, Richard Gossett, Hector Neff, and Daniel O. Larson. Submitted to Journal of Archeology. 32 pp.

1998 **Sediment Chemistry: Final Report for the Southern California Bight Pilot Project 1994.** Ken Schiff and Richard Gossett.

1998 **A Review of Five Years of Monitoring Data Of Grunion In Santa Barbara Harbor. Final Report to the US Army Corp of Engineers, Los Angeles California.** Richard Peiper, Richard Gossett, and Carrie Wolfe. 47 pp.

1997 **A Review of Chemistry Methods Used for Sediments and Tissues for the County Sanitation Districts of Orange County Ocean Monitoring Program.** Richard Gossett. A report to the County Sanitation Districts of Orange County-April 1997. 18 pp.

1996 **Organic contaminants in sediments of the Newport Submarine Canyon, California and the adjacent shelf.** Don Mauer, George Robertson, Tom Gerlinger, and Richard Gossett. *Water Environment Research*, Vol. 68, No. 6.

1991 **Sources and Magnitude of Bias Associated With Determination of Polychlorinated Biphenyls (PCB) in Environmental Samples.** Robert P. Eganhouse and Richard W. Gossett. *Analytical Chemistry*, Vol. 63, No. 19.

1990 **Congener-Specific Characterization and Source Identification of PCB Input to Los Angeles Harbor.** Robert P. Eganhouse, Richard W. Gossett and G. Patrick Hershelman. A Report of the Southern California Coastal Water Research Project to the California Regional Water Quality Control Board, Contract No. 7-184-140-0, 46 pp.

1990 **Historical Deposition and Biogeochemical Fate of Polycyclic Aromatic Hydrocarbons in Sediments near a Major Submarine Wastewater Outfall in Southern California**. Robert P. Eganhouse and Richard W. Gossett. Technical Report of the Southern California Coastal Water Research Project, Long Beach, California, 43 pp.

1989 **Human Serum DDT Levels Related To Consumption of Fish from the Coastal Waters of Los Angeles**. Richard W. Gossett, Gary Wikholm, John Ljubenkov and David Steinman. *Environmental Toxicology and Chemistry*, 8:951-955.

1988 **Persistence of Chlorinated Hydrocarbon Contamination in a California Marine Ecosystem**. David R. Young, Richard W. Gossett and Theodore C. Heesen. *In*: Oceanic Processes in Marine Pollution, Volume 5:Urban Wastes in Coastal Marine Environments, D. A. Wolfe and T.P. O'Connor, eds., Krieger Publishing Company, Malabar, Florida, p. 33-41.

1988 **Measurement of Oxygenated Metabolites of DDTs and PCBs: A Caution. Rapid Communication**. Richard W. Gossett. *Marine Environmental Research*, 26:155-159.

1988 **Municipal Wastewater and Runoff Inputs to the Southern California Bight**. Henry A. Schafer and Richard W. Gossett. *In*: Proceedings of the Symposium: Managing Inflows to California's Bays and Estuaries, Monterey, California, November 13-15, 1986. The Bay Institute, Sausalito, California.

1988 **Characteristics of Stormwater Runoff from the Los Angeles and Ventura Basins**. Henry A. Schafer and Richard W. Gossett. Report of the Southern California Coastal Water Research Project to the California Regional Water Quality Control Board, Contract No. 6-157-140-0, 58 pp.

1987 **Polynuclear Aromatic Hydrocarbon Contamination in Sediments from Coastal Waters of Southern California**. Jack W. Anderson and Richard W. Gossett. Final Report of the Southern California Coastal Water Research Project to the California State Water Resources Control Board, 67 pp.

1987 **Contaminant Concentrations and Toxicity of Sea-surface Microlayer near Los Angeles, California**. Jeffrey N. Cross, John T. Hardy, Jo Ellen Hose, G. Patrick Hershelman, Richard W. Gossett and Eric A. Crecelius. *Marine Environmental Research*, 23:307-323.

1987 **Chlorinated Hydrocarbon Contamination in Dover Sole from Contaminated Sites Off Southern California**. Jack W. Anderson, Richard W. Gossett, Chuck F. Ward and Alvin M. Westcott. Report of the Southern California Coastal Water Research Project to the County Sanitation District of Los Angeles County, Whittier, California, 46 pp.

1987 **Oxygenated Metabolites of DDT and PCBs in Marine Sediments and Organisms**. *In*: Oceanic Processes in Marine Pollution, Volume 1: Biological Processes and Wastes in the Ocean. David A. Brown, Richard W. Gossett and Sophia R. McHugh. J.M. Capuzzo and D.R. Kester, eds., Krieger, Melbourne, Florida.

1986 **Contaminants in Sediments of Two Nearshore Basin Slopes off Southern California**. Bruce E. Thompson, G. Patrick Hershelman and Richard W. Gossett. *Marine Pollution Bulletin*, 17:404-409.

1986 **Municipal Wastewater Contamination in the Southern California Bight: Part I- Metal and Organic Contaminants in Sediments and Organisms**. David A. Brown, Richard W. Gossett, G. Patrick Hershelman, Charles F. Ward, Alvin M. Westcott and Jeffrey N. Cross. *Marine Environmental Research*, 18:291-310.

1985 **Environmental Impact Statement/Report: Union Oil Project/Central Santa Maria Basin Area Study, Marine Water Quality, I. Baseline**. W. Craig Meyer, David A. Brown, Richard W. Gossett and G. Patrick Hershelman. Prepared by Aquatic Research Consultants for Arthur D. Little, Inc., Cambridge, Massachusetts, 261 pp.

1985 **Using the Natural Detoxification Capacities of Organisms to Asses the Environmental Impact of Contaminants**. David A. Brown, Steven M. Bay, Darrin J. Greenstein, Peter Szalay, Richard W. Gossett, Charles F. Ward, Alvin M. Westcott, Karen D. Rosenthal and G. Patrick Hershelman. Year II, Annual Report to the Office of Exploratory Research, June 1985, Environmental Protection Agency, Grant No. R81024801. Washington D.C., 46 pp.

1984 **Using the Natural Detoxification Capacities of Marine Organisms to Assess Assimilative Capacity**. David A. Brown, Steven M. Bay and Richard W. Gossett. *In*: Aquatic Toxicology and Hazard Assessment: 7th Symposium. ASTM STP 854, R.D. Cardwell, R. Purdy and R.C. Bahner, eds., p. 364-382.

1984 **Sediment and Biological Conditions on Coastal Slopes**. Bruce E. Thompson, Jeffrey N. Cross, James D. Laughlin, G. Patrick Hershelman, Richard W. Gossett and David T. Tsukada. *In*: Southern California Coastal Water Research Project Biennial Report, 1983-1984, W. Bascom, ed., Long Beach, California, p. 37-67.

1984 **Metal and Organic Contaminants in Sediments and Animals**. David A. Brown, Richard W. Gossett, G. Patrick Hershelman, Charles F. Ward and Jeffrey N. Cross. In: Southern California Coastal Water Research Project Biennial Report, 1983-1984, W. Bascom, ed., Long Beach, California, p. 179-193.

1984 **Marine Water Quality, Part Three: Environmental Consequences, Mitigation Measures and Cumulative Impacts**. David A. Brown, W. Craig Meyer, Ann B. Brown, G. Patrick Hershelman and Richard W. Gossett. Prepared by Aquatic Terrestial Research Corp. for Arthur D. Little, Inc., Santa Barbara, California. *In*: Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plan EIR/EIS, Technical Appendix H-Water/Marine. SCH# 83110911, County of Santa Barbara SBC# 84-EIR-16, U.S. Minerals Management Service MMS-YN-EIS-84-002, California State Lands Commission SLC-EIR-366, 140 pp.

1984 **Marine Water Quality, Part Two: Environmental and Regulatory Setting**. David A. Brown, W. Craig Meyer, Bruce E. Thompson, Richard W. Gossett, G. Patrick Hershelman and Ann B. Brown. Prepared by Aquatic Terrestial Research Corp. for Arthur D. Little, Inc., Santa Barbara, California. *In*: Point Arguello Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS, Technical Appendix H-Water/Marine. SCH# 83110911, County of Santa Barbara SBC# 84-EIR-16, U.S. Minerals

Management Service MMS-YN-EIS-84-002, California State Lands Commission SLC-EIR-366, 140 pp.

1984 **Pre-discharge Studies for Deep Sludge Disposal off Orange County: Second Year Report, 1984.** Contributor: A Report to the County Sanitation Districts of Orange County from the staff of the Southern California Coastal Water Research Project, Long Beach, California, 102 pp.

1984 **Xenobiotic Organics and Biological Effects in Scorpionfish Caged near a Major Southern California Municipal Outfall.** Richard W. Gossett, Sophia R. McHugh, Peter Szalay, Karen D. Rosenthal and David A. Brown. *Marine Environmental Research*, 14:449-450.

1983 **Predicting the Bioaccumulation of Organic Compounds in Marine Organisms using Octanol/Water Partition Coefficients.** Richard W. Gossett, David A. Brown and David R. Young. *Marine Pollution Bulletin*, 14:387-392.

1983 **DDT, PCB and Benzo[a]pyrene levels in White Croaker (*Genyonemus lineatus*) from Southern California.** Richard W. Gossett, Harold W. Puffer, Robert H. Arthur Jr. and David R. Young. *Marine Pollution Bulletin*, 14:60-65.

1983 **PCB, DDT and Benzo[a]pyrene in Raw and Pan-fried White Croaker (*Genyonemus lineatus*).** Harold W. Puffer and Richard W. Gossett. *Bulletin of Environmental Contamination and Toxicology*, 30:65-73.

1983 **Bioaccumulation and Detoxification of Contaminants in Marine Organisms from Southern California.** David A. Brown, Richard W. Gossett, G. Patrick Hershelman, Henry A. Schafer, Kenneth D. Jenkins and Edwin M. Perkins. *In*: Waste Disposal in the Oceans: Minimizing Impacts, Maximizing Benefits, D.F. Soule and D. Walsh, eds., Westview Press, Boulder, Colorado, p. 171-193.

1983 **A Survey of the Slope off Orange County, California: First Year Report, 1983.** Contributor: A Report to the County Sanitation Districts of Orange County from the Staff of the Southern California Coastal Water Research Project, Long Beach, California.

1982 **Levels of Trace Organic Compounds in Sportfish from Southern California.** Richard W. Gossett, Harold W. Puffer, Robert H. Arthur Jr., Jennifer F. Alfafara and David R. Young. *In*: Southern California Coastal Water Research Project Biennial Report, 1981-1982, W. Bascom, ed., Long Beach, California, p. 29-37.

1982 **Wastewater Inputs and Marine Bioaccumulation of Priority Pollutant Organics off Southern California.** David R. Young, Richard W. Gossett, Roger B. Baird, David A. Brown, Paul A. Taylor and Michael J. Miille. *In*: Water Chlorination- Environmental Impact and Health Effects, Volume 4, Book 1: Chemistry and Water Treatment, R.L. Jolley, ed., Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, p. 871-884.

1982 **Contaminants in White Croaker *Genyonemus lineatus* (Ayres, 1855) from the Southern California Bight: II. Chlorinated Hydrocarbon Detoxification/Toxification.** David A. Brown, Richard W. Gossett and Kenneth

D. Jenkins. *In*: Physiological Mechanisms of Marine Pollutant Toxicity, W. Vernberg, ed., Academic Press, New York, New York, p. 215-231.

1982 **Detoxification of Metals and Organic Compounds in White Croakers**. David A. Brown, Kenneth D. Jenkins, Edwin M. Perkins, Richard W. Gossett and G. Patrick Hershelman. *In*: Southern California Coastal Water Research Project Biennial Report, 1981-1982, W. Bascom, ed., Long Beach, California, p. 157-172.

1982 **Pollutant Flow Through the Marine Food Web**. David R. Young, Alan J. Mearns, Henry A. Schafer, G. Patrick Hershelman, Richard W. Gossett and Tsu-Kai Jan. Final Report, Grant PFR-7715376 to the National Science Foundation from the Southern California Coastal Water Research Project, Long Beach, California, 177 pp.

1980 **Trophic Structure and Pollutant Concentrations in Marine Ecosystems of Southern California**. David R. Young, Alan J. Mearns, Tsu-Kai Jan, Theodore C. Heesen, Michael D. Moore, Robert P. Eganhouse, G. Patrick Hershelman and Richard W. Gossett. *California Cooperative Oceanic Fisheries Investigations Reports*, 21:197-206

1980 **Trace Pollutants in Surface Runoff**. David R. Young, Tsu-Kai Jan, Richard W. Gossett and G. Patrick Hershelman. *In*: Southern California Coastal Water Research Project Biennial Report, 1979-1980, W. Bascom, ed., Long Beach, California, p. 163-169.

1980 **Chlorinated Benzenes in Sediments and Organisms**. David R. Young and Richard W. Gossett. *In*: Southern California Coastal Water Research Project Biennial Report, 1979-1980, W. Bascom, ed., Long Beach, California, p. 181-195.

1980 **Mass Spectrometry Confirmation of PCB and DDT Analyses of Fish**. Tai-Ching Liu-Hu, Richard W. Gossett and David R. Young. *In*: Southern California Coastal Water Research Project Biennial Report, 1979-1980, W. Bascom, ed., Long Beach, California, p. 131-138.

1979 **Chlorinated Benzenes in Southern California Municipal Wastewaters and Submarine Discharge Zones**. David R. Young, Theodore C. Heesen and Richard W. Gossett. *In*: Water Chlorination- Environmental Impact and Health Effects, Volume 3, R. L. Jolley, W.A. Brungs, R.B. Cumming and V.A. Jacobs, eds., Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, p. 472-483.

Charles A. Phillips
12122 Paseo Bonita
Los Alamitos, California 90720
(714) 397-0014

Education

B.S. Marine Biology, California State University Long Beach, 1976

Professional Experience

City of Los Angeles – Environmental Monitoring Division 1979 – present [Water Biologist II] Senior taxonomist: Supervisor of marine benthic ecology group – responsible for identification of marine and estuarine infauna and trawl caught fish and invertebrates required for NPDES monitoring studies of Santa Monica Bay and outer Los Angeles Harbor; data analysis of completed infauna samples for statistical calculations; supervision of field studies (benthic infauna, trawl, water column, and microlayer). Additional projects include the taxonomic study of the Order Cumacea in the Southern California Bight and clarification of the taxonomy of the genera within the Family Cirratulidae in the Southern California Bight.

Taxonomic Consultant (1981 – Present)

Marine Ecological Consultants:

1986 – present	Identification of Polychaeta and Mollusca from Los Angeles Harbor and Orange County Sanitation Districts; sort Los Angeles County Sanitation Districts Polychaeta into families; identification of LA3 dumpsite polychaeta; identification of BIGHT '98 polychaeta, identification of PSAMP polychaeta; QA identification of PSAMP miscellaneous phyla, SCCWRP stormwater identification polychaeta, mollusca, miscellaneous phyla; QA identification CARP tanaidacea

SAIC:

1998 – 2000	QA/QC sort and identification of Orange County Sanitation Districts NPDES benthic infauna (polychaeta, mollusca, miscellaneous phyla)

ABC Labs:

1998 – present	identification of benthic infauna Marina del Rey (all phyla); identification of Crustacea from minor POTW (Avalon, Carpenteria, Gaviota, Morro Bay, Oxnard); identification BIGHT '98 Crustacea

Cove Corporation:

1998 – present	identification of Family Cirratulidae (Polychaeta) [Massachusettes Water Resources Authority – Boston Harbor]

Osprey Marine Management:

1987 – present — sorting and identification of marine and estuarine benthic samples (Army Corps of Engineers – Oceanside, Santa Ana River, Sunset Beach); identification of all phyla LA3/LA2 dumpsites; identification of all phyla small POTW (Avalon, Carpenteria, Gaviota, San Luis Obispo, Santa Barbara, Ventura); identification of all phyla Shell Oil Platforms (Huntington Beach), Marina del Rey

Marine Taxonomic Services:

1995 – 1999 — identification of polychaeta (ASARCO/Puget Sound/Tacoma copper smelter); secondary ID Crustacea (Oregon/Puget Sound)

EVS Consultants:

1990 – 1991 — identification of polychaeta (Puget Sound)

Dames & Moore:

1989 – 1991 — secondary (QA) identification of miscellaneous phyla (intertidal/subtidal) [Nemertea, Sipuncula, Echiura, Phoronida] from Prince William Sound and Kodiak, Alaska (EXXON Valdez Oil Spill)

Battelle – Ventura:

1987 – 1989 — identification of Nemertea and Sipuncula [MMS Year 1 Santa Maria Basin]

Marine Biological Consultants:

1983 – 1986 — sorting/identification Long Beach Harbor rip-rap infauna; identification of polychaeta [MMS baseline Santa Maria Basin]

Reish Marine Studies:

1981 – 1986 — identification of all phyla Los Angeles Harbor; identification of all phyla Gulf of Farallons radioactive dumpsite

Reish Marine Studies (1975 – 1979)

(Graduate Student CSULB)

Supervisor of field sampling (shipboard/diver core); sorting and identification of benthic infaunal samples; monitoring of marine fouling communities; live culture and bioassay studies of marine polychaetes

Lockheed Marine Research (1977 – 1978)

Field sampling plankton (bongo/manta nets), entrainment and conduit grazing studies (Scattergood Generating Plant, Harbor Generation Station, Alamitos Bay Generating Station)

Harbor Environmental Studies, University of Southern California (1975 – 1977)

Research Assistant, cleaning and sorting of Los Angeles Harbor benthic infaunal samples; training in identification polychaeta and mollusca

California State University Long Beach (1976 – 1979)

Graduate Assistant and Teaching Assistant (Department of Biology)

Publications

Dorsey, J.H. and C.A. Phillips. 1987. A new species of *Syllis (Ehlersia)* (Polychaeta, Syllidae) from southern California, and description of the epitoke and atoke variation in *S. (Ehlersia) heterochaeta* Moore, 1909. Proceedings Biological Society of Washington, Bulletin No. 7, 152-161.

Dojiri, M., D.B. Cadien and C.A. Phillips. 1991. A new species of *Ammothella* (Pycnogonida:Ammotheidae) from deep water off San Nicolas Island, California. Bijdragen tot de Dierkunde, 61(1):31-41.

Memberships

Biological Society of Washington
California Malacozoological Society
Crustacean Society
Southern California Association of Marine Invertebrate Taxonomists
Southern California Academy of Sciences
Western Society of Malacologists
Western Society of Naturalists

Dean Pasko

643 N. Granados Avenue, Solana Beach, CA 92075-1266
☎ (H) 858-792-9522 • (W) 619-758-2334 • 💻 (W) dpasko@sandiego.gov or (H) deanpasko@yahoo.com

EDUCATION

Master of Arts - Biology, Humboldt State University, Arcata, CA. August, 1987.
- James E. Christian II Scholarship in Biological Sciences, 1982

Bachelor of Science - Biology, Loyola Marymount University, Los Angeles, CA. Spring, 1979.
- Athletic Scholarship, Men's Volleyball, 1975 - 1978

FIELDS OF STUDY AND RELEVANT SKILLS

Benthic Ecology
Crustacean Biology & Taxonomy
Invertebrate Taxonomy
Biological Oceanography
Environmental Ecology
Marine Biology

- Knowledgeable of marine benthic sampling and analytical techniques, water quality analysis (bacteriological indicators), acute and chronic toxicity testing and field sampling techniques
- Experienced in sampling design, data collection, analysis, report writing
- Capable seaman experienced with small to large monitoring and research vessels operating all types of sampling gear and scientific instruments
- Proficient with PC, and Macintosh computer systems including word processing, desk top publishing, statistical analysis packages, presentation, image acquisition and manipulation, relational database, and internet applications
- NAUI and PADI certified SCUBA diver

WORK EXPERIENCE

CITY OF SAN DIEGO MARINE BIOLOGY LABORATORY, San Diego, CA.
Supervisor: Data Management & Reporting Section, November 2001 – present
Marine Biologist, January 1986 – November 2001

General responsibilities Manage the Data Management & Reporting Section tasked with assessment of environmental impact of the Point Loma and South Bay Ocean Outfalls according to NPDES receiving waters monitoring program requirements. Supervise the reporting of compliance with California Ocean Plan standards and NPDES permit requirements, as well as data analysis and reporting necessary to fulfill all regulatory requirements.

Invertebrate Taxonomy Identify benthic organisms and develop identification aids (e.g., taxonomic keys, species voucher sheets) for use by other marine biologists. Perform QA/QC (re-identification) analysis of other marine biologists. Specialization: Crustacea, Nemertea, Cnidaria, and other 'minor phyla.'

Taxonomy Training Coordinator Directed the development of a permanent training program in invertebrate taxonomy and benthic infauna identification. The 6 month training program consists of invertebrate zoology and taxonomy workshops, field sampling, QA/QC measures, various methods of assessment, and a *Benthic Taxonomy and Infauna Identification Training Manual* (7 volumes, 1345 pp).

Program Design Participated in the design and implementation of the outfall extension pre- and post-discharge monitoring programs; consultant to the International Boundary and Water Commission (United States and Mexican governments) for the design and implementation of the IBWC's wastewater discharge monitoring program, and various special studies designed to enhance environmental assessment.

Committees Privatization and Competitiveness Committee, Southern California Bight Pilot Project (SCBPP-EMAP) Subcommittee on Trawl and Benthic Sampling, Vehicle Accident Review Committee (Chair), NPDES and Regional Monitoring Program Re-assessment and Planning Committee

WORK EXPERIENCE *continued*

INDEPENDENT CONSULTANT, San Diego, CA.
Invertebrate Taxonomy, January 1986 - present
Perform primary identification, voucher verification, and QA/QC of sorted and enumerated samples of benthic macroinvertebrates; specializing in marine Crustacea, Cnidaria, Nemertea, and other 'minor phyla'. Experience includes eastern Pacific Ocean from northern Baja California, Mexico to Puget Sound, Washington, USA, from coastal embayments to 1,000 m depth.

SOUTHWESTERN COLLEGE, DIVISION OF MATH/SCIENCES, Chula Vista, CA
Adjunct Instructor, Fall 1989 - Fall 1993
Introduction to Oceanography, Marine Bio-Ecology, Principles of Biology (Lecture & Laboratory).
Curriculum Development Grant, Fall 1991 - Spring 1992
Development of four Biology Laboratory Investigations for BIOL 101: Diffusion/Osmosis, Photosynthesis and Respiration, Pollution and the Environment, and Supermarket Botany.

PUBLICATIONS

In Preparation. T.D. Stebbins and D. Pasko. ***Long-term changes in crustacean assemblages near a deep ocean outfall in southern California*** .

In Preparation. D. Pasko and T.D. Stebbins. ***Several new species of Photis (Amphipoda: Isaeidae) from southern California with a revised key to the genus.***

In Preparation. T.D. Stebbins and D. Pasko. ***The genus Edotia (Isopoda: Valvifera: Idoteidae) in the northeast Pacific with the description of two species and a review of the distribution and ecology of the genus.***

1994. D.L. Zmarzly, T.D. Stebbins, D. Pasko, R. Duggan, and K.L. Barwick. ***Spatial patterns and temporal succession in soft-bottom macroinvertebrate assemblages surrounding an ocean outfall on the southern San Diego shelf: Relation to anthropogenic and natural events.*** Marine Biology 118: 293-307.

1987. ***Host specificity and behavior of Hyperia medusarum and Hyperoche mediterranea (Amphipoda: Hyperiidea): Symbionts on gelatinous zooplankton.*** M.A. thesis, Humboldt State University, 106 pp.

PRESENTATIONS

2004. ***The Benthic Infaunal Community of San Diego Bay.*** (co-author) Southern California Academy of Sciences, 2004 Annual Meeting.

2004. ***The State of San Diego Bay in 1998: Ecological Conditions.*** (co-author) Southern California Academy of Sciences, 2004 Annual Meeting.

2003. ***Sediment Conditions within San Diego Bay – Results of the Bight'98 Regional Survey.*** (Senior author) Western Society of Naturalists, 2003 Annual Meeting.

2001. ***Artificial Key to the Phoxocephalidae from Coastal Waters of the Southern California Bight.*** Southern California Association of Marine Invertebrate Taxonomists, 29 October 2001.

1996. ***The City of San Diego's Benthic Taxonomy and Infauna Identification Training Program.*** North American Association of Marine Invertebrate Taxonomists, 26 January 1996.

1992. ***The Chaetopteridae and Onuphidae (Polychaeta) from the Southern California Bight.*** Southern California Association of Marine Invertebrate Taxonomists, 8 June 1992.

1991. ***The Spionidae from shelf waters of Southern California.*** (with Mr. L. Lovell). Southern California Association of Marine Invertebrate Taxonomists, 11 February 1991.

PRESENTATIONS *continued*

1984. ***Host specificity and behavior of Hyperia medusarum and Hyperoche mediterranea (Amphipoda: Hyperiidea): Symbionts on gelatinous zooplankton***. Western Society of Naturalists, 28 December 1984.

TECHNICAL REPORTS

2001–present. ***Point Loma Ocean Outfall Receiving Waters Monitoring Report.*** Editor. City of San Diego, Metropolitan Wastewater Department, Environmental Monitoring &Technical Services Division, San Diego, CA.

2001–present. ***South Bay Ocean Outfall Receiving Waters Monitoring Report.*** Editor. City of San Diego, Metropolitan Wastewater Department, Environmental Monitoring &Technical Services Division, San Diego, CA.

1995. ***Benthic Taxonomy and Infauna Identification Training Manual***. Editor. City of San Diego, Metropolitan Wastewater Department, Technical Services Division, San Diego, CA.

1994. T.D. Stebbins, D. Pasko and R. Duggan. ***Effects of the Number of Replicate Samples***. Technical Report. City of San Diego, Metropolitan Wastewater Department, Technical Services Division, San Diego, CA.

1990. ***Point Loma Ocean Monitoring Program, Receiving Waters Monitoring Annual Report, 1989***. Editor. City of San Diego, Water Utilities Department, Metro Wastewater Division, San Diego, CA.

1989. ***Point Loma Ocean Monitoring Program, Receiving Water Monitoring Annual Report, 1988***. Editor. City of San Diego, Water Utilities Department, Metro Wastewater Division, San Diego, CA.

1987. ***Point Loma Ocean Monitoring Program, 1987 Benthic Report***. Editor. City of San Diego, Water Utilities Department, Metro Wastewater Division, San Diego, CA.

PROFESSIONAL AFFILIATIONS

- The Crustacean Society
- Biological Society of Washington
- Western Society of Naturalists (WSN)
- Southern California Association of Marine Invertebrate Taxonomists (SCAMIT)
- Southern California Academy of Sciences (SCAS)
- North American Association of Marine Invertebrate Taxonomists (NAMIT)

COMMUNITY & ACADEMIC ORGANIZATIONS

- *Member,* City of Solana Beach Public Safety Commission, 1999–2003
- *Founder, Chairman,* Save Old Solana, 1995–1997; Steering Committee, 1997–2001
- *Judge*, San Diego Science Fair, 1993–1995
- *Vice-president*, Save the Whales, 1988–1991
- *Treasurer*, Biology Graduate Student Association, Humboldt State University, 1982–1983
- *Co-founder, Vice-president*, Marine Biology Society, Loyola Marymount University, 1979

References available upon request

Resume

KELVIN L. BARWICK

6134 Carling Way
San Diego, California 92115
hm: 619-583-6582
wk: 619-758-2337
kelvinbarwick@hotmail.com

Work Experience

Self-employed
San Diego, California

Title: Taxonomic Consultant (1999 - Present)

Duties: Perform Mollusk identifications and QA under contract to a number of organizations. Samples are collected from a broad range of areas of the northeast Pacific. These include:

- MCI Global Cross Project in Monterey Bay, Moss Landing Marine Laboratory
- Bahia Santa Rosalita, Baja California, Mexico, EcoMar
- Gray's Harbor, Washington, Merkel & Associates, Inc.
- Sewage outfall monitoring programs for Goleta and Oxnard, California, Aquatic Bioassay & Consulting Laboratory
- Ballast Water Program, Introduced Species Survey covering the entire California outer coast and embayments, Moss Landing Marine Laboratory

City of San Diego's Metropolitan Waste Water Department
Environmental Monitoring and Technical Services
Marine Biology Laboratory
San Diego, California

Title: Marine Biologist II (1989 - Present)

Duties: Work extensively in all aspects of marine invertebrate taxonomy; specializing in Polychaetes and Mollusks. Duties include: species level identification, preparation of in-house identification aids and voucher sheets, independent taxonomic investigations, training, and QA/QC. Work with digital imagery using both Mac and PC platforms. Assist in all types field sampling as

part of ocean outfall monitoring program. Perform above duties for a number of different projects:

- City of San Diego Ocean Monitoring Program
- Southern California Regional Bight Projects
- International Boundary and Water Commission's International Treatment Plant

Work Experience continued...

MEC Analytical Systems, Inc.
Carlsbad, California

Title: Senior Laboratory Technician (1986 - 1989)

Duties: Mollusk identifications. Participated in the field collection of sediment, plankton, and water samples, as well as macro- invertebrates and fish. Other duties included: benthic sorting, QA, and coding of infaunal samples. Most sampling was performed in bays, near, and offshore areas of southern California.

LGL Ecological Research Associates, Inc.,
Bryan, Texas

Title: Laboratory Technician (1984 - 1986)

Duties: Sorted and identified infaunal and epifaunal invertebrates from marine and brackish waters from the northern Gulf of Mexico, Prudhoe Bay, and the Sagavanirktok and Colville river deltas, Alaska.

Non-Taxonomic Technical Abilities

Extensive experience with digital light microscopy. Have a good working knowledge of both the Adobe creative software suite including: Photoshop, Indesign, Acrobat, and Illustrator and the Microsoft Office suite including: Word and Excel.

Education

Bachelor of Science in Wildlife and Fisheries Sciences
Texas A & M University
College Station, Texas
Fields of Study - Invertebrate Zoology, Ichthyology, Marine Biology, Limnology, Oceanography, and Fisheries Ecology

Publications

Valdés, Á. and K. Barwick. 2005. First record of Akera Müller, 1776, from the eastern Pacific with the description of a new species. The Nautilus, 119(1) 43-49.

Zmarzly, D. L., T. D. Stebbins, D. Pasko, R. M. Duggan, and K. Barwick. 1994. Spatial patterns and temporal succession in soft-bottom macro invertebrate assemblages surrounding an ocean outfall on the southern San Diego shelf: relation to anthropogentic and natural events. Mar. Biol. 118:293-307.

Professional Affiliations

President, Southern California Association of Marine Invertebrate Taxonomists (SCAMIT)
Member, San Diego Shell Club

MEGAN B. LILLY

EDUCATION

B.S. - Marine Biology, 1991
Humboldt State University, Arcata, California

Fields of Study
Intertidal Ecology
Freshwater Ecology
Invertebrate Zoology
Invertebrate Physiology
Marine Mollusks and Echinoderms

WORK EXPERIENCE

Consultant July 1995 - present
City of San Diego, Marine Biology Laboratory

Consultant to the International Boundary and Water Commission, United States and Mexico.

Marine Biologist II April 1994 - present
City of San Diego, Marine Biology Laboratory

Marine Biologist I October 1993 - April 1994
City of San Diego, Marine Biology Laboratory

Research Assistant April 1993 - May 1993
"The New Horizon" Research Cruise, Oahu, Hawaii

Assisted in the collection of mid-water marine invertebrates. Conducted research examining the muscle buffering capacity and respiration rates of various fauna. Chief scientist - Dr. J. Childress, University of California, Santa Barbara.

Research Assistant March 1993
"The New Horizon" Research Cruise, Point Conception, California

Assisted in the collection of mid-water marine invertebrates using a tucker trawl net. Chief scientist - Dr. J. Childress, Univ. of Cal., Santa Barbara.

Laboratory Technician February 1993 - October 1993
University of California, Santa Barbara, CA

Chemical analyses of rain, stream, snow and soil samples. Analyses included determining pH values of soil samples in paste and soil solutions ($CaCl_2$ and distilled water), and detection of PO_4 and NH_4^+ levels present in stream and snow samples. Data entry and analysis.

Laboratory Technician November 1992 - October 1993
University of California, Santa Barbara, CA

Collection and identification of stream invertebrates. Supervision and training of employees. Inventory and organization of sample collection.

Curatorial Assistant May 1991 - October 1992
Santa Barbara Museum of Natural History, Santa Barbara, CA

Curation, identification and dissection of marine invertebrates. Computer data entry and manipulation, tracking of specimen loans.

RELEVANT SKILLS

PADI certified SCUBA diver
Scientific and technical writing
Taxonomy of marine mollusks, echinoderms and miscellaneous phyla

TECHNICAL CONTRIBUTIONS

"*Octopus veligero*: permanent resident or fair-weather friend?" Poster presentation, American Malacological Society, July 2000.

"The Effects of Organic Enrichment on Molluscan Distribution and Abundance on the Mainland Shelf Off San Diego." Poster presentation, Western Society of Malacologists, June 1994.

PROFESSIONAL ORGANIZATIONS

Secretary of SCAMIT (Southern California Association of Marine Invertebrate Taxonomists), 1998 to present.

MELINDA M. SWEENY
Senior Marine Scientist

Ms. Sweeny has a wide range of interests and experience in marine biology including benthic ecology, ichthyology, and marine mammology. Her experience includes quantitative fish and marine invertebrate collection, water quality data collection, identification of benthic and ichthyoplanktonic organisms, and marine mammal physiology as well as data analysis, statistical analysis, and technical writing.

EDUCATION

M.A. 2003, Marine Biology, Boston University
B.S. 1988, Wildlife and Fisheries Biology, University of California Davis

PROFESSIONAL EMPLOYMENT HISTORY

2006-Present	Normandeau Associates, Inc.
1997-2006	Marine Research, Inc.
1985-1996	University of California Davis, Wild Horse Valley Ranch, and Groton House Farm
1989-1990	California Department of Fish and Game
1989-1990	Robert Mondavi Winery
1983-1985	Woods Hole Oceanographic Institution
1982	Marine Biological Laboratory

PROFESSIONAL AFFILIATIONS

World Wildlife Foundation
International/National Wildlife Federation
Marine Mammal Society

SELECTED PROJECT EXPERIENCE

ENSR and Reliant Energy Mandalay and Ormond Stations (2006-Present) - Fisheries monitoring of Mandalay and Ormond Station vicinity, Southern California Bight. Sort and identify ichthyoplankton and crustaceans. Principal taxonomist.

Beacon Port Proposed LNG Terminal (2004-2005) – Ichthyoplankton study 50 miles off theTexas coast in the Gulf of Mexico. Sort and identify ichthyoplankton. Principal taxonomist.

MassDCR/Parsons Brinkerhoff Quade & Douglas/Applied Coastal Research & Engineering (2002-Present) - Impact assessment of offshore dredge site for beach nourishment in Winthrop. Sort and identify, benthic organisms and stomach contents of juvenile and adult fish. Analyze data (including statistical analysis) and write corresponding report sections. Taxonomist and Technical Writer.

National Marine Fisheries Service (1999-Present) - Analysis of North East Atlantic fish stomach contents. Taxonomist.

Dominion Energy Brayton Point (1997-Present) - Studies of Mount Hope Bay and the vicinity of the Brayton Point Power Study to evaluate the effects of plant cooling systems on the ecology of the bay. Collect, sort, and identify ichthyoplankton, assist in report writing. Taxonomist and Technical Writer.

Entergy Nuclear Operations Pilgrim Station (1997-Present) - Radiological environmental monitoring program at Pilgrim Station. Sort and identify ichthyoplankton and adult fish. Taxonomist and Technical Writer.

Dominion Energy Manchester Street (1997-Present) - Studies of Providence River and vicinity to evaluate effects of plant cooling system on the river's ecology. Collect, sort, and identify ichthyoplankton, assist in report writing. Taxonomist and Technical Writer.

ConEdison and TRC (2000-2004) - Fisheries and benthic studies in Piscataqua River, NH and

MELINDA M. SWEENY
Senior Marine Scientist

ME in support of new plant licensing requirements, Newington. Sort and identify ichthyoplankton and benthic samples. Data analysis of benthos including qualitative analysis of benthic video study. Taxonomist and Technical Writer.

SPECIAL TRAINING

Environmental Site Assessment courses (non-degree) at University of Massachusetts Dartmouth, Massachusetts Maritime Academy, and Cape Cod Community College, 1997.
Toxic Use Reductions Act (TURA), 1997
OSHA
Scuba (NAUI), 1985

SELECTED PRESENTATIONS AND PUBLICATIONS

Sweeny, M.M., J.M. Price, G.S. Jones, T.W. French, G.A. Early, and M.J. Moore. 2005. Spondylitic changes in long-finned pilot whales (*Globicephala melas*) stranded on Cape Cod, Massachusetts, USA between 1982-2000. Journal of Wildlife Diseases 41(4):717-727.

FORM P-3

QUALITY CONTROL PLAN – Please See Following Pages

a. Who will review the reports/analysis/documents prepared by your office?

b. What steps will you take to correct deficiencies reported by the Department or discovered by your reviewer?

c. If the Department complains that work has not been adequately performed and requests immediate correction, how soon will your firm be able to respond?

d. How will you cover unexpected absences?

e. If you have a written quality control plan, inspection plan or written procedures for your staff, please attach them.

11/22/07

3.0 Quality Control Plan (Form P-3)

We have responded below to the specific questions on Form P-3 in the RFP. For further QC information on our Marina del Rey sampling program, please refer to the attached Quality Assurance Project Plan for the Marina del Rey Environmental Monitoring Program.

a. Ms. Karin Wisenbaker will continue to be the QC officer for the Marina del Rey monitoring program. Her role includes insuring that all field sampling, laboratory analyses, and data management processes follow Aquatic Bioassay procedures. Once final results have been entered into the final database, Karin authorizes release of the data to the Project Manager, Scott Johnson who checks the data for inconsistencies, outliers, missing values, etc. Once the data have received final authorization for use, final reports are generated and checked for accuracy by the Project Manager. The final annual reports are reviewed and checked for consistency and accuracy by the President and owner of Aquatic Bioassay, Mr. Tim Mikel. Only after all changes requested by Mr. Mikel have been included in the final report, is it released to the client for review.

b. Immediately upon identification of reporting errors or inconsistencies either internally by the Aquatic Bioassay QC team or by the client, we review the issue as a team and document the problem.
   - In the case of a data error, the QC officer directs the staff member who is most familiar with the dataset to find and correct the error. Once the correction has been made the database is updated and the change is documented. When necessary a new report is created and sent to the client for review.
   - In the case of a sampling error (i.e. sample not collected, date deadline missed) our team will discuss the available options we have to correct the problem, and then discuss these options with the client. If the problem cannot be fixed, first we will insure that it does not happen again by more thoroughly training our staff. Second we will contact any appropriate regulatory agencies for the Department to discuss the error and how we are mitigating the problem.

c. As a company we take pride in the fact that we work efficiently and accurately to provide our clients with scientifically defensible work products. Aquatic Bioassay has a company policy of taking corrective action immediately when our client feels work has not been adequately performed or request immediate action to correct an error. This could include any data, sampling or reporting error that is found. In general we assign the appropriate staff member who will work until the problem is solved. This includes working over the weekend or at night.

d. Aquatic Bioassay has a staff that is both dedicated and cross trained in all aspects of the Marina del Rey Monitoring Program. In ten years of continuous sampling and reporting, we have never missed a sampling event or reporting deadine.

e. Please find attached our Quality Assurance Project Plan for the Marina del Rey Environmental Monitoring Program.

BUSINESS AND FINANCIAL SUMMARY

Attach all documentation listed on Pages 5-6 of the RFP.

1. List all of the governmental agencies and private institutions for which your firm has provided marine environment monitoring services during the last five years. *(At least 5 years' experience in the field must be demonstrated.)* FAILURE TO LIST ALL OF YOUR FIRM'S EXPERIENCE WITH GOVERNMENT AGENCIES AND PRIVATE INSTITUTIONS DURING THE LAST FIVE YEARS MAY RESULT IN REJECTION OF YOUR PROPOSAL.

GOVERNMENT AGENCIES:

Start of Contract	End of Contract	Name of client	Address of client	Project Mgr./ Contact person	Phone number	Description of Services
1997	July 2006	LA County Dept. of Beaches & Harbors	13837 Fiji way Marina del Rey CA 90292	Don Geisinger	310-305-9506	Marine Environment Monitoring and Analysis in Marina del Rey
1988	on-going	City of Oxnard	6001 S. Perkins Rd Oxnard, CA 93033	mark Plumpfold	805-488-3517	Marine Environmental Monitoring and Analysis
1988	on-going	City of Avalon	Pebbly Beach Rd, P.O. Box 1810 Avalon CA 90704	Mike Jones	310-510-0731	Marine Environmental Monitoring and Analysis
2002	2006	SCCWRP	7171 Fenwick Ln, Westminster CA	Steve Bay	714-372-9204	CSTF - Marine Environmental monitoring and Analysis
2002	2002	City of Santa Barbara	El Estero wwTP 92683 520 Yanonali St. Santa Barbara, CA 93102	Rebecca Bjork	805-997-1914	Marine Environmental Monitoring and Analysis
1998	2003	SCCWRP	7171 Fenwick Ln Westminster, CA 92683	Steve Weisberg	714 372-9203	Marine Environmental Monitoring & Analysis for Bight 98" & Bight 03" studies
Aug 2005	Aug 2005	City of Ventura	P.O. Box 99 Ventura, CA 93002	Mary Joyce Ivers	805-652-4539	Caulerpa Survey adjacent to Ventura Piers
Nov 2006	Nov 2006	Army Corps. of Engineers	915 Wilshire Blvd. Los Angeles, CA 9005	Jim Fields	213-452-3403	Caulerpa Survey in Marine del Rey Harbor

Add additional pages if necessary to list all experience with Government Agencies.

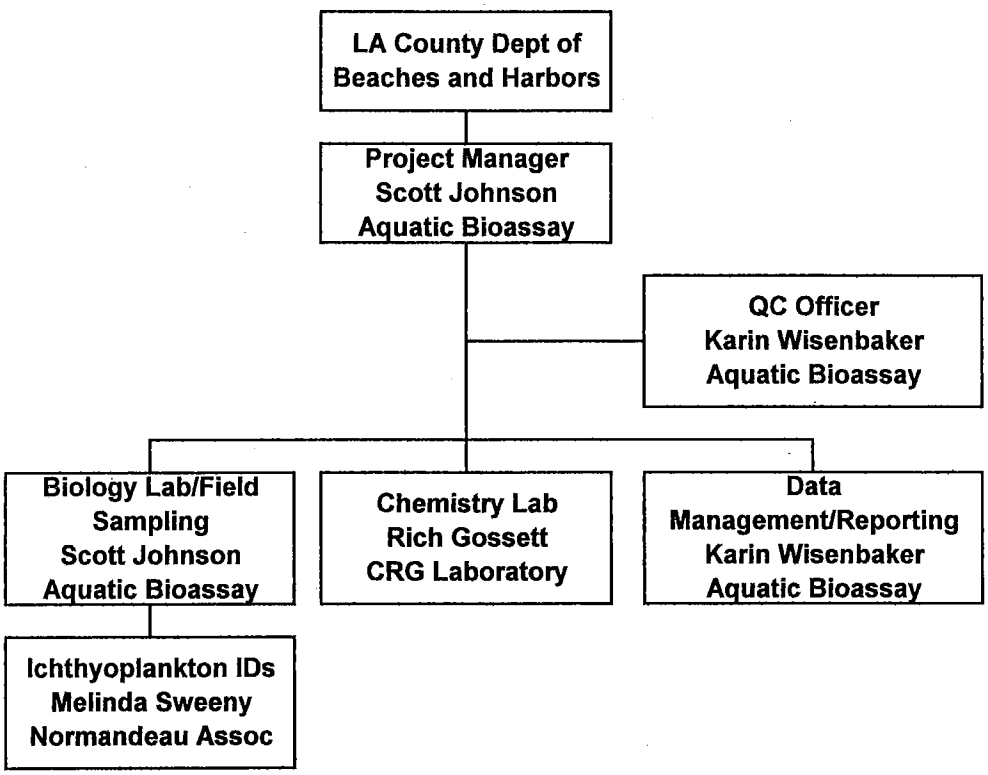
PRIVATE INSTITUTIONS:

Start of Contract	End of Contract	Name of client	Address of client	Project Mgr./ Contact person	Phone number	Description of Services
1997	on-going	Goleta Sanitary District	1000 Fowler Rd. Goleta, CA 93117	Kathleen Werner	805-967-4519	marine Environmental monitoring and Analysis
1988	on-going	Carpinteria Sanitary District	5351 6th St. Carpinteria, CA 93013	Frank Gonzales	805-684-7214	marine Environmental monitoring and Analysis
1991	2002	Argonaut Inc.	17110 Calle Mariposa Reina Goleta CA 93117	David Rose	805 567-1633	marine Environmental monitoring and Analysis
2002	present	Impact Sciences	803 Camarillo Springs Rd, Suite A Camarillo, CA 93012	David Sakowicz	805-437-1900	marine Environmental monitoring and Analysis
2004	2004	Montecito Sanitary District	1042 Monte Cristo Ln Santa Barbara, CA	Brad Walker	805 969-4200	marine Environmental monitoring and Analysis
		Anchor Environmental	28202 Cabot Rd. Suite 620, Laguna Niguel CA 92677	Steve Cappellino	949-347-2780	marine Environmental monitoring and Analysis

2. How many full-time workers does your firm employ? 11

3. Attach an organizational chart or describe the organization of your firm: Attached following

Aquatic Bioassay Team Organization Chart



4. CREDIT REFERENCES. List at least three recent credit or financial references:

Name	Address	Business relationship	Contact person	Phone number
Wells Fargo	115 W. main St. Ventura, CA 93001	Business Banking	Customer Service	805-641-9585
VWR International	1310 Goshen Parkway West Chester, PA 19380	Equipment and laboratory Supplies	Accounts Receivable	800-932-5000
Aquatox Inc.	416 Twin Points Rd. Hot Springs, Arkansas	Supplier of toxicity testing organisms	Accounts Receivable	501-520-0560
Aquatic BioSystems	1300 Blue Spruce Dr. Suite C Fort Collins, CO 80524	Supplier of toxicity testing Organisms	Accounts Receivable	970-484-5091

5. EVIDENCE OF INSURABILITY. Attach a letter of commitment, binder or certificate of current insurance coverage meeting the limits and other requirements of Section 3.9 of the Contract.

6. LABOR AND PAYROLL VIOLATIONS. Within the last three years, a public entity (including, but not limited to, the State Labor Commission, the Los Angeles County Auditor-Controller, the Los Angeles County Office of Affirmative Action Compliance, and any other County department):

☒ has not found the Proposer responsible for any labor, wage, or payroll violations

☐ has found the proposer responsible for the following violation(s):

7. ADDITIONAL INFORMATION (Attach additional pages if necessary):

4.0 Demonstration of Work Experience (P-4)

Below we present several more detailed examples of some of our marine monitoring project experience:

Marina Del Rey Harbor. Mr. Don Geisinger (310 305 9506). Since 1997, the *Aquatic Bioassay* team has been conducting long-term multispecific studies of Marina Del Rey Harbor for the Los Angeles Department of Beaches and Harbors. Studies include monthly water column and bacterial surveys; semiannual fish surveys including ichthyoplankton tows, set-nets, trawls, beach seines, and diver transects; and annual chemical and infaunal analysis of the benthic sediments. The infauna data generated from this program are summarized in an annual report which includes all the basic biological metrics, the Benthic Response Index (BRI) and multivariate statistics. Aquatic Bioassay team members represent the City of Oxnard during all Southern California Regional Montoring Program activities.

City of Oxnard. Mr. Mark Pumpford, 805-488-3517. Since 1979, the *Aquatic Bioassay* Oceanographic Team has been conducting one of the largest ongoing municipal receiving monitoring program in southern California. In addition to the identification of infauna organisms, the study requires quarterly surveys of water quality, current speed and direction studies, effluent plume modeling, analysis of benthic fish, fish and invertebrate tissue analysis, and dive surveys including underwater photography and video. The water quality surveys are regionally conducted in coordination with Orange County Sanitation Districts, the Sanitation Districts of Los Angeles County, and the City of Los Angeles. The infauna data generated from this program are summarized in an annual report which includes all the basic biological metrics, the Benthic Response Index (BRI) and multivariate statistics. Aquatic Bioassay team members represent the City of Oxnard during all Southern California Regional Montoring Program activities. These surveys have been conducted every five years since 1994 throughout the southern California bight and include extensive design, sampling, analysis and reporting services.

Southern California Bight Project. Dr. Stephen Weisberg, 714-894-2222. The *Aquatic Bioassay* Oceanographic Team has been participating in this region-wide marine monitoring study since the fall of 1997. This project is being coordinated by the U.S. EPA and the Southern California Coastal Water Research Project and is the largest ocean monitoring study in the nation. Other participants include the U.S. Navy, National Parks Service, UCLA, USC, UCSB, Channel Islands National Marine Sanctuary, all of southern California's coastal POTW's and watershed protection agencies. Aquatic Bioassay's participation includes water column sampling, shoreline bacterial sampling, bottom sediment sampling for chemical analysis and infauna, trawl sampling with fish and invertebrate identification, infaunal taxonomy, sediment toxicity bioassays, and data analysis and reporting. In addition, Aquatic Bioassay staff are members on the following committees; Steering, Toxicology, Microbiology, Field Methods, Fish Taxonomy, Benthic Taxonomy, Water Quality, and Data Management. Our Director was also co-chair of the Toxicity Committee. Aquatic Bioassay has served as a contract benthic infauna taxonomy laboratory for SCCWRP for the past five years, having sorted and identified organisms collected for the WEMAP project and San Diego Bay TMDL study.

Los Angeles Contaminated Sediments Task Force, Long Term Monitoring of the Confined Aquactic Disposal Site in Long Beach Harbor. Steve Bay (SCCWRP) 714-372-9204. The Los Angeles Basin Contaminated Sediments Task Force (CSTF) currently is evaluating several treatment and disposal alternatives for contaminated dredged material. One of these options is confined aquatic disposal (CAD), where dredged material is placed in a pit and capped with clean sediments. Aquatic Bioassay has conducted all phases of the monitoring for this site which includes multibeam bathymetry, remote and diver assisted video studies, sediment coring, benthic infauna sediment sampling and sediment toxicity testing. Results from this survey have been

synthesized into presentations and reports that will assist port managers to develop a strategic plan for disposal of dredged materials.

Goleta Sanitation District. Ms. Kathleen Werner, 805-967-4519. Since 1998 the Aquatic Bioassay team has been conducting quarterly compliance monitoring surveys for the district. These surveys include water quality, fish trawls, benthic taxonomy and chemistry, bioaccumulation studies and current meter studies as well as dive surveys including underwater photography and video.

Long Term Monitoring of the Confined Aquactic Disposal Site in Long Beach Harbor. Jim Fields (US Army Corp of Engineers) 213-452-3403. The Army Corp of Engineers is currently evaluating the long term success of a confined aquatic disposal (CAD) site in Long Beach Harbor, where dredged material were placed in a pit and capped with clean sediments. Aquatic Bioassay has conducted all phases of the monitoring for this site which includes multibeam bathymetry, remote and diver assisted video studies, sediment coring, benthic infauna sediment sampling and sediment toxicity testing. Results from this survey have been synthesized into presentations and reports that will assist port managers to develop a strategic plan for disposal of dredged materials.

City of Avalon. Mr. Mike Jones, 310-510-0731. Since 1990 the Aquatic Bioassay team has been conducting the annual surveys that include diver collection of sediment samples using hand-held corers to depths of 41 meters (135 feet). Samples are tested for benthic biota and chemical analysis and underwater survey of outfall biota using photographs and video are conducted.

City of Santa Barbara. Ms. Rebecca Bjork, 805-897-1914. In 2002 the Aquatic Bioassay team was awarded the contract for the triennial compliance monitoring survey for the El Estero Wastewater Treatment Plant. This survey includes water quality, fish trawls, benthic taxonomy and chemistry, bioaccumulation studies and dive surveys.

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YY): 1/18/2007

PRODUCER

BC ENVIRONMENTAL INS.BROKERS INC.
1037 SUNCAST LANE, SUITE 103
EL DORADO HILLS, CA 95762
(916) 939-1080

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURERS AFFORDING COVERAGE

INSURED: AQUATIC BIOASSAY & CONSULTING LAB
dba ABC LABORATORIES
29 NORTH OLIVE STREET
VENTURA, CA 93001

INSURER A: HUDSON SPECIALTY INS. CO. #37079
INSURER B: UNIGARD INSURANCE COMPANY #25747
INSURER C:
INSURER D:
INSURER E:

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY X COMMERCIAL GENERAL LIABILITY CLAIMS MADE [X] OCCUR X CONT. POLLUTION X PROF-CLMS.MADE GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY [ ] PRO-JECT [ ] LOC	FEC6108321 PL RETRO: 7/29/04	07/29/06	07/29/07	EACH OCCURRENCE FIRE DAMAGE (Any one fire) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$1,000,000 $ 50,000 $ 5,000 $1,000,000 $2,000,000 $2,000,000
B	AUTOMOBILE LIABILITY X ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS X HIRED AUTOS X NON-OWNED AUTOS	CM007452	07/29/06	07/29/07	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$1,000,000 $ $ $
	GARAGE LIABILITY ANY AUTO				AUTO ONLY - EA ACCIDENT OTHER THAN AUTO ONLY: EA ACC AGG	$ $ $
	EXCESS LIABILITY OCCUR CLAIMS MADE DEDUCTIBLE RETENTION $				EACH OCCURRENCE AGGREGATE	$ $
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				X WC STATUTORY LIMITS [ ] OTHER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ $ $
B	OTHER PROPERTY	CM007452	07/29/06	07/29/07		

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

RE: MARINE ENVIRONMENT MONITORING AND ANALYSIS IN MARINA DEL REY
THE COUNTY OF LOS ANGELES, ITS SPECIAL DISTRICTS, ITS OFFICIALS, OFFICERS AND EMPLOYEES HAVE BEEN NAMED AS ADDITIONAL INSURED WITH RESPECT TO THE GENERAL LIABILITY ONLY.
(ENDORSEMENT ATTACHED)

CERTIFICATE HOLDER | ADDITIONAL INSURED; INSURER LETTER:

LOS ANGELES COUNTY DEPARTMENT OF BEACHES
AND HARBORS - PLANNING DEPT.
13837 FIJI WAY
MARINA DEL REY, CA 90292
ATTN: MS. SUSY ORELLONA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE: Matthew C Wallace

HUDSON INSURANCE

ABC Labs

ADDITIONAL INSURED – DESIGNATED PERSON OR ORGANIZATION

This endorsement changes the Policy. Please read it carefully.
Policy # FEC6108321 Effective Date: 01-18-07

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name of Person or Organization:

The County of Los Angeles, its special Districts, it officials, officers and employees
13837 Fiji Way
Marina Del Rey, CA 90292

RE: Marine Environment Monitoring and Analysis

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

WHO IS AN INSURED (Section II) is amended to include as an insured the person or organization shown in the Schedule as an insured but only with respect to liability arising out of your operations or premises owned by or rented to you.

CERTHOLDER COPY SL

STATE COMPENSATION INSURANCE FUND

P.O. BOX 420807, SAN FRANCISCO,CA 94142-0807

CERTIFICATE OF WORKERS' COMPENSATION INSURANCE

ISSUE DATE: 01-17-2007

GROUP: 000541
POLICY NUMBER: 0000308-2008
CERTIFICATE ID: 40
CERTIFICATE EXPIRES: 08-01-2007
08-01-2008/08-01-2007

MARINE ENVIRONMENT MONITORING & ANALYSIS SL
L.A. COUNTY DEPT. OF BEACHES & HARBOR
13837 FIJI WAY
MARINA DEL REY CA 90292-5810

This is to certify that we have issued a valid Workers' Compensation insurance policy in a form approved by the California Insurance Commissioner to the employer named below for the policy period indicated.

This policy is not subject to cancellation by the Fund except upon 30 days advance written notice to the employer.

We will also give you 30 days advance notice should this policy be cancelled prior to its normal expiration.

This certificate of insurance is not an insurance policy and does not amend, extend or alter the coverage afforded by the policy listed herein. Notwithstanding any requirement, term or condition of any contract or other document with respect to which this certificate of Insurance may be issued or to which it may pertain, the insurance afforded by the policy described herein is subject to all the terms, exclusions, and conditions, of such policy.

AUTHORIZED REPRESENTATIVE

PRESIDENT

EMPLOYER'S LIABILITY LIMIT INCLUDING DEFENSE COSTS: $1,000,000 PER OCCURRENCE.

ENDORSEMENT #1600 - THOMAS K MIKEL PRESIDENT - EXCLUDED.

ENDORSEMENT #2085 ENTITLED CERTIFICATE HOLDERS' NOTICE EFFECTIVE 10-13-2006 IS ATTACHED TO AND FORMS A PART OF THIS POLICY.

EMPLOYER

AQUATIC BIOASSAY & CONSULTING LABORATORIES INC
29 N OLIVE ST
VENTURA CA 93001

(REV.2-05)

(RDA,SC)
PRINTED : 01-17-2007

REQUEST FOR PROPOSALS -- PROPOSER'S CERTIFICATION

On behalf of Proposer Thomas (Tim) Mikel, Aquatic Bioassay & Consulting, Inc. the undersigned certifies, declares and agrees as follows:

1. **Absence of Any Conflict of Interest.** The Proposer is aware of the provisions of Section 2.180.010 of the Los Angeles County Code and certifies that neither Proposer nor its officers, principals, partners or major shareholders are employees of either the County or another public agency for which the Board of Supervisors is the governing body or a former employee who participated in any way in the development of the Contract or its service specifications within 12 months of the submission of this Proposal.

2. **Independent Price Determination.** The Proposer certifies that the prices quoted in its Proposal were arrived at independently, without consultation, communication, or agreement with any other Proposer for the purpose of restricting competition.

3. **Compliance with County Lobbyist Ordinance.** The Proposer is familiar with the requirements of Chapter 2.160 of the Los Angeles County Code. All persons acting on Proposer's behalf have complied with its provisions and will continue to do so pending and subsequent to the award of the Contract by the Board of Supervisors.

4. **Antidiscrimination.**

   (a) In accordance with Section 4.32.010.A of the Los Angeles County Code, all persons employed by the Proposer, its affiliates, subsidiaries, or holding companies are and will be treated equally by the firm without regard to or because of race, religion, ancestry, national origin or sex and in compliance with all anti-discrimination laws of the United States and the State of California. The following policies and procedures shall be in force and effect over the Contract term: (1) a written policy statement prohibiting discrimination in all phases of employment; (2) periodic self-analysis or utilization analysis of Proposer's work force; (3) a system for determining if Proposer's employment practices are discriminatory against protected groups; and (4) where problem areas are identified in employment practices, a system for taking reasonable corrective action to include establishment of goals or timetables;

   OR:

   (b) Proposer is exempt from the provisions of Section 4.32.010 because the Contract is for the performance of professional, scientific, expert or technical services of a temporary and occasional character involving only a single individual or an individual or a firm employing less than 10 persons in connection with the performance of such Contract.

5. **Consideration of GAIN/GROW Participants for Employment.** As a threshold requirement for consideration for Contract award, Proposer shall demonstrate a proven record of hiring GAIN/GROW participants or shall attest to a willingness to consider GAIN/GROW participants for any future employment opening. Additionally, Proposer shall attest to a willingness to provide employed GAIN/GROW participants access to the Proposer's employee mentoring program, if available, to assist these individuals in obtaining permanent employment and promotional opportunities.

   Proposer has a proven record of hiring GAIN/GROW participants (subject to verification; attach proof);

   OR:

   Proposer is willing to consider GAIN/GROW participants for any future employment opening and to provide employed GAIN/GROW participants access to the Proposer's employee mentoring program, if available.

On behalf of Proposer, I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct:

President / Laboratory Director
Title

Thomas (Tim) Mikel
Name

Signature

1/22/07
Date

FORM P-6

County of Los Angeles – Community Business Enterprise Program (CBE)

Request for Local SBE Preference Program Consideration and CBE Firm/Organization Information Form

INSTRUCTIONS: All proposers/bidders responding to this solicitation must complete and return this form for proper consideration of the proposal/bid.

I. **LOCAL SMALL BUSINESS ENTERPRISE PREFERENCE PROGRAM:**

FIRM NAME: Agnatia Biassay and Consulting, Inc.

☒ I AM NOT
☐ I AM

A Local SBE certified by the County of Los Angeles Office of Affirmative Action Compliance as of the date of this proposal/bid submission.

☐ As an eligible Local SBE, I request this proposal/bid be considered for the Local SBE Preference.

My County (WebVen) Vendor Number: _____

II. **FIRM/ORGANIZATION INFORMATION:** The information requested below is for statistical purposes only. On final analysis and consideration of award, contractor/vendor will be selected without regard to race/ethnicity, color, religion, sex, national origin, age, sexual orientation or disability.

Business Structure: ☐ Sole Proprietorship ☐ Partnership ☒ Corporation ☐ Non-Profit ☐ Franchise ☐ Other (Please Specify) _____

Total Number of Employees (including owners): 11

Race/Ethnic Composition of Firm. Please distribute the above total number of individuals into the following categories:

Race/Ethnic Composition	Owners/Partners/ Associate Partners		Managers		Staff	
	Male	Female	Male	Female	Male	Female
Black/African American						
Hispanic/Latino						
Asian or Pacific Islander				1	1	
American Indian						
Filipino					2	
White	1		2	1	1	2

III. **PERCENTAGE OF OWNERSHIP IN FIRM:** Please indicate by percentage (%) how ownership of the firm is distributed.

	Black/African American	Hispanic/ Latino	Asian or Pacific Islander	American Indian	Filipino	White
Men	%	%	%	%	%	100 %
Women	%	%	%	%	%	%

IV. **CERTIFICATION AS MINORITY, WOMEN, DISADVANTAGED, AND DISABLED VETERAN BUSINESS ENTERPRISES:**
If your firm is currently certified as a minority, women, disadvantaged or disabled veteran owned business enterprise by a public agency, complete the following and attach a copy of your proof of certification. (Use back of form, if necessary.)

Agency Name	Minority	Women	Dis-advantaged	Disabled Veteran	Expiration Date

V. **DECLARATION:** I DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF CALIFORNIA THAT THE ABOVE INFORMATION IS TRUE AND ACCURATE.

Print Authorized Name	Authorized Signature	Title	Date
Michael Machuzak	[signature]	Asst. Lab Director	1/22/07

FORM P-7

COUNTY OF LOS ANGELES CONTRACTOR EMPLOYEE JURY SERVICE PROGRAM CERTIFICATION FORM AND APPLICATION FOR EXCEPTION

The County's solicitation for this Request for Proposals is subject to the County of Los Angeles Contractor Employee Jury Service Program (Program), Los Angeles County Code, Chapter 2.203. All proposers, whether a contractor or subcontractor, must complete this form to either certify compliance or request an exception from the Program requirements. Upon review of the submitted form, the County department will determine, in its sole discretion, whether the Bidder is excepted from the Program.

Company Name:	Aquatic Biology and Consulting, Inc.
Company Address:	29 N. Olive St.
City: Ventura	State: CA Zip Code: 93001
Telephone Number:	805-643-5621
Solicitation For (Type of Services):	Marine Environmental Monitoring and Analysis

If you believe the Jury Service Program does not apply to your business, check the appropriate box in Part I (attach documentation to support your claim); or, complete Part II to certify compliance with the Program. Whether you complete Part I or Part II, please sign and date this form below.

Part I: Jury Service Program is Not Applicable to My Business

- ☐ **My business does not meet the definition of "contractor," as defined in the Program, as it has not received an aggregate sum of $50,000 or more in any 12-month period under one or more County contracts or subcontracts (this exception is not available if the contract itself will exceed $50,000). I understand that the exception will be lost and I must comply with the Program if my revenues from the County exceed an aggregate sum of $50,000 in any 12-month period.**

- ☐ **My business is a small business as defined in the Program. It 1) has ten or fewer employees; and, 2) has annual gross revenues in the preceding twelve months which, if added to the annual amount of this contract, are $500,000 or less; and, 3) is not an affiliate or subsidiary of a business dominant in its field of operation, as defined below. I understand that the exception will be lost and I must comply with the Program if the number of employees in my business and my gross annual revenues exceed the above limits.**

  "Dominant in its field of operation" means having more than ten employees, including full-time and part-time employees, and annual gross revenues in the preceding twelve months, which, if added to the annual amount of the contract awarded, exceed $500,000.

  "Affiliate or subsidiary of a business dominant in its field of operation" means a business which is at least 20 percent owned by a business dominant in its field of operation, or by partners, officers, directors, majority stockholders, or their equivalent, of a business dominant in that field of operation.

- ☐ **My business is subject to a Collective Bargaining Agreement (attach agreement) that expressly provides that it supersedes all provisions of the Program.**

OR

Part II: Certification of Compliance

- ☒ **My business has and adheres to a written policy that provides, on an annual basis, no less than five days of regular pay for actual jury service for full-time employees of the business who are also California residents, or my company will have and adhere to such a policy prior to award of the contract.**

I declare under penalty of perjury under the laws of the State of California that the information stated above is true and correct.

Print Name: Michael Mackenzie	Title: Asst. Laboratory Director
Signature:	Date: 1/22/07

FORM P-8

CHARITABLE CONTRIBUTIONS CERTIFICATION

Aquatic Bioassay and Consulting, Inc.
Company Name

29 N. Olive St., Ventura, CA 93001
Address

77-0192238
Internal Revenue Service Employer Identification Number

California Registry of Charitable Trusts "CT" number (if applicable)

The Nonprofit Integrity Act (SB 1262, Chapter 919) added requirements to California's Supervision of Trustees and Fundraisers for Charitable Purposes Act which regulates those receiving and raising charitable contributions.

Check the Certification below that is applicable to your company.

☒ Proposer or Contractor has examined its activities and determined that it does not now receive or raise charitable contributions regulated under California's Supervision of Trustees and Fundraisers for Charitable Purposes Act. If Proposer engages in activities subjecting it to those laws during the term of a County contract, it will timely comply with them and provide County a copy of its initial registration with the California State Attorney General's Registry of Charitable Trusts when filed.

OR

☐ Proposer or Contractor is registered with the California Registry of Charitable Trusts under the CT number listed above and is in compliance with its registration and reporting requirements under California law. Attached is a copy of its most recent filing with the Registry of Charitable Trusts as required by Title 11 California Code of Regulations, sections 300-301 and Government Code sections 12585-12586.

Signature

1/22/07
Date

Michael Machuzak, Asst. Laboratory Director
Name and Title of Signer (please print)

Aquatic Bioassay & Consulting Laboratories, Inc.

Marine Field & Laboratory
Quality Assurance Project Plan

For the:

Marina del Rey
Environmental Monitoring Program

Prepared by
Scott Johnson
Aquatic Bioassay & Consulting Laboratories
29 N Olive St. Ventura, CA 93001

November 2006

Table of Contents

Elements: Project Management
Title & Approval Sheets

Quality Assurance Project Plan

PROJECT: Marine field and laboratory operations

DATE: November, 2006

RESPONSIBLE ORGANIZATION:

: Aquatic Bioassay & Consulting Laboratories
29 N. Olive St.
Ventura, CA 93001

APPROVAL SIGNITURES

Aquatic Bioassay & Consulting Laboratories

President & Director
Mr. Tim Mikels — Date 1/22/07

Assistant Laboratory Director
Michael Machuzak — Date 1/22/07

Director of Environmental Programs
Scott Johnson — Date 1/22/07

Biology QA/QC Officer
Karin Wisenbaker — Date 1/22/07

Distribution List

The final QAPP will be kept on file at the Aquatic Bioassay and Consulting Laboratory offices in Ventura, CA. The following individuals will receive copies of the approved QAPP and any subsequent revisions:

Name, Affiliation, Contact Information	Project Title
Mr. Tim Mikels Aquatic Bioassay & Consulting Laboratories 29 N. Olive St. Ventura, CA 93001 tim@TimMikel.com (805) 643 5621	President and Director
Michael Machuzak Aquatic Bioassay & Consulting Laboratories 29 N. Olive St. Ventura, CA 93001 aquabio@pactbell.net (805) 643 5621	Assistant Director
Scott Johnson Aquatic Bioassay & Consulting Laboratories 29 N. Olive St. Ventura, CA 93001 sci_aqua@pactbell.net (805) 643 5621	Environmental Prg Director
Karin Wisenbaker Aquatic Bioassay & Consulting Laboratories 29 N. Olive St. Ventura, CA 93001 abclabs@pactbell.net (805) 643 5621	Project QC Officer

Project/Task Organization

Involved Parties and Roles.

The Los Angeles County Department of Beaches and Harbors (Department) is a governmental agency charged with the operation of Marina del Rey Harbor, the largest small craft harbor in the world. As part of their operations, the Department is responsible with the environmental oversight of the Marina.

Aquatic Bioassay and Consulting Laboratories (Aquatic Bioassay) is the lead consultant on this project, responsible for project management, the organization of sample collection, the analysis of samples and data, quality assurance and ensuring the timely completion of all electronic data submittal products and the annual summary report. In addition, Aquatic Bioassay will collect water and sediment samples, analyze bioassessment samples and perform both aquatic and sediment toxicity tests as necessary. Scott Johnson will be the Project Manager for this study and has established a project team for planning and conducting the study.

CRG Marine Laboratories, located in Torrance, will perform the water, sediment and tissue chemistry analyses, and the bacteriological analyses for all samples collected during the monitoring program. Rich Gossett will oversee these analyses.

Normandeau Associates will identify ichthyoplankton samples under the direction of Ms. Melinda M. Sweeny.

Quality Assurance Officer Role

Karin Wisenbaker will be the Quality Assurance Officer. Karin's role is to establish the quality assurance and quality control procedures found in this QAPP as part of the sampling and analysis procedures. Karin will work with field and laboratory managers by communicating all quality assurance and quality control issues contained in this QAPP.

Karin will also review and assess all procedures during the life of the contract against QAPP requirements. Karin will report all findings to Scott Johnson, including all requests for corrective action. Karin may stop all actions, including those conducted by Aquatic Bioassay, CRG Marine Laboratories and Normandeau if there are significant deviations from required practices or if there is evidence of a systematic failure.

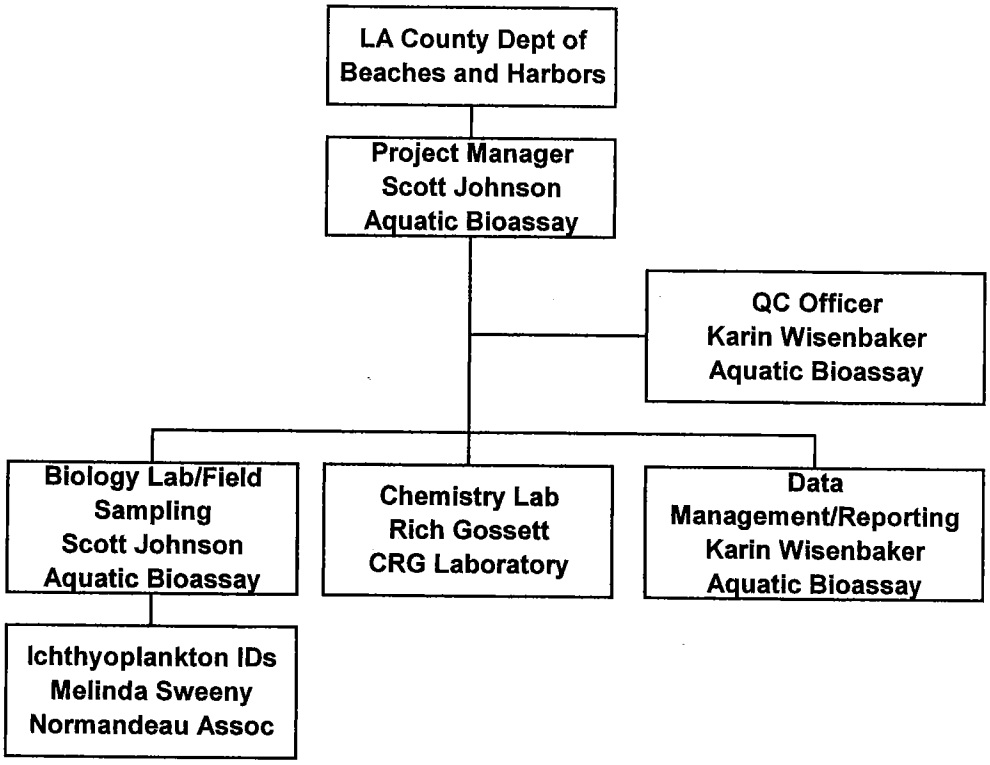
Persons Responsible for QAPP Update and Maintenance.

Changes and updates to this QAPP may be made after a review of the evidence for change by the Project Director, Project Manager, and Quality Assurance Officer. The

Changes and updates to this QAPP may be made after a review of the evidence for change by the Project Director, Project Manager, and Quality Assurance Officer. The Project Manager will be responsible for making the changes, submitting drafts for review, preparing a final copy, and submitting the final for signature.

Organizational Chart and Responsibilities

Aquatic Bioassay Team Organization Chart



PROJECT BACKGROUND

The Marina del Rey monitoring program has been conducted on a nearly annual basis over 25 years, and has resulted in the collection and assessment of thousands of data points for water quality, sediment chemistry, and infauna and fish assemblages. Harbors Environmental Projects of the University of Southern California (HEP, USC) initiated baseline studies in Marina del Rey in 1976, with partial funding from the Federal Sea Grant Program and the County of Los Angeles. After a five year hiatus between 1979 and 1984, the survey has continued unabated to this year. Between 1984 and 1996, monitoring was conducted by the University of Southern California (Soule and Oguri 1980, 1981, 1985, 1986, 1988, 1990, 1991, 1994; Soule, Oguri and Jones, 1991, 1992a, 1992b, 1993; Soule, Oguri, and Pieper, 1996, 1997), and then by Aquatic Bioassay and Consulting Laboratories from 1997 to present (Aquatic Bioassay 1997-98, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03).

These monitoring surveys have provided a unique, long term record of the water quality and ecology of the Marina. These data are being used extensively by state, federal and local governments to help develop best management practices that will protect the numerous beneficial uses of the Marina. The indicator bacteria data collected monthly over the past seven years are currently being used by the Los Angeles Regional Water Quality Control Board, the County of Los Angeles, the Cities of Los Angeles and Culver City, and CalTrans, as part of the Marina del Rey Harbor Bacterial Total Maximum Daily Load (TMDL) program. These bacteria data have helped regulators and program participants to determine the rate of REC-1 water quality exceedances. Additionally, the extensive sediment chemistry and benthic infauna datasets will be available if, as currently expected, the TMDL program grows to include sediment contaminants.

History of Marina del Rey

Marina del Rey Harbor opens to the Pacific Ocean in Santa Monica Bay and is located on unincorporated County of Los Angeles land, surrounded by the City of Los Angeles and Culver City (Figure 1-1). The Marina was developed in the late 1950's and early 1960's on degraded wetlands that formed part of the Ballona Creek Wetlands (Figure 1-2). The wetlands once extended through the communities of La Ballona, Port Ballona, and what is now Venice on the north, to the Baldwin Hills and the San Diego Freeway on the east, and to the Westchester bluffs on the south. The current Marina del Rey watershed is approximately 2.9 square miles (Figure 1-3) and drains a highly urbanized area with land uses that include residential, commercial and industrial. The Marina is the largest artificial small-craft harbor in the United States and harbors more than 5,000 privately owned pleasure craft and includes dry boat storage and launch facilities.

Historically, a number of streams meandered through the Ballona Wetlands, forming a large pond that drained into what are now Ballona Lagoon and Del Rey Lagoon. A barrier beach enclosed these lagoons which then opened into Santa Monica Bay. In the mud flats, birds, mollusks, and crustaceans abounded, along with mosquitoes and midges in the standing freshwater pools. Urbanization overtook the wetlands, with the development of oil and gas fields, truck farms, and industrial sites, each of which resulted in piecemeal dumping and filling of the wetland. Ballona Creek was channalized by the Army Corp of Engineers in the 1920's to control flooding and to further encourage development.

During World War II (WWII), industrial activity increased extensively with no regulatory controls on land fills or dumping of toxic materials. Postwar residential development expanded urbanization to the margins of the reduced wetlands. After WWII interest in recreational boating increased. This, coupled with new affluence, increased the pressure to create marinas to accommodate this pastime. Construction of Marina del Rey began in 1958 with the building of concrete walls on dry land, then the basins and channels were excavated. A breakwater was added across the Marina's mouth soon after construction was completed due to vessel damage caused by large southwest swells from a winter storm. As a result, circulation in the Marina is limited especially in the back basins. As more slips and vessels were added, they acted to even further damp the limited circulation. Additional historical information can be found in Bancroft (1884) and Beecher (1915).

The combination of channalization and reduced circulation have deprived this once natural wetland of the normal cycles of both fresh and seawater renewal, and nutrient and sediment inputs from the surrounding watershed. Contaminants present either from historic disposal or present day urban runoff are therefore not quickly flushed from the Marina. This monitoring program was designed to investigate how these conditions have effected the water quality and biological communities of the Marina.

Summary of Historical Survey Results

Soule et al. (1993) reviewed the reasons for undertaking baseline studies in the Marina based on inquiries from the County about the productivity of the waters. Results of monitoring and research studies in Marina del Rey from 1976-1979 and 1984 to 2004 are summarized below:

Although levels of pesticides, some heavy metals and PCBs are present in levels sufficient to inhibit reproductive stages of sensitive species, most have declined over time. Heavy metals tend to be complexed to the finest grain sediments in the harbor and/or enter the harbor in runoff. High concentrations of organotins, which can be toxic in very low concentrations, have been steadily declining possibly related to the banning of tri-butyl tin in vessel paint.

Polychlorinated biphenyls (PCBs) have appeared episodically over the years. Some terrestrial soils in areas to the north of the marina are known to contain high levels of PCBs that can enter drainage channels during grading or excavation. Pilot analyses of terrestrial soils surrounding Oxford Basin indicate that most areas are heavily contaminated with heavy metals, chlorinated pesticides, and polynuclear aromatic hydrocarbons.

About 115 species or larval taxa of fishes have been reported in the Marina, more than for any other wetlands in the area. The fish species represent the remains of the wetlands fauna that has been largely shut off from the wetlands south of Ballona Creek. The Marina still acts as an important nursery ground for fishes, with numerous larval forms found during current surveys. The rocky breakwater and jetties are important to species that would otherwise not find a habitat in the marina. The sea grass beds in sandy Basin D have been important to the development of larval and juvenile fish, which also provided forage for larger fish.

When excessive coliform and enterococcus bacterial contamination is found throughout the marina, it is largely due to runoff as evidenced by the high levels that occur at Ballona Creek, Marina Beach and Oxford Basin immediately after storms in the winter. Ballona Creek and back Basins E and D (including Mother's Beach), where circulation is poorest, have recently been added to the State's 303 (d) list as impaired water bodies due to exceedances of the total and/or fecal coliform standards contained in the California Ocean Plan (2001). This listing has prompted the development of bacterial Total Maximum Daily Load (TMDL) projects led by the Los Angeles Regional Water Quality Control Board; and, a recently completed state funded project led by the Los Angeles County Department of Beaches and Harbors called the Marina Beach Water Quality Improvement Project (LACDBH 2004).

Monthly water quality survey data do not indicate a serious or widespread problem with sewage release from vessels within the Marina. An inventory of existing pump-out conditions within the Marina indicated that there were sufficient facilities to meet the demands of the current boater use. Regardless, a new Department of Beaches and Harbors regulation requires that as new or existing leases are issued, the lessee must provide at least one pump-out station.

PROJECT/TASK DESCRIPTION

Work Statement and Produced Products

Aquatic Bioassay shall be responsible for the performance of the work as set forth herein below and for the preparation of products and a final report as specified in this Exhibit. Aquatic Bioassay shall promptly notify the Department Project Director of events or proposed changes that could affect the scope, budget, or schedule of work performed under this Agreement. Unless otherwise specified in the Agreement, all deliverables shall be provided to the Project Director, Contract Manager and other members of the Department.

The monitoring program can be divided into three main components:

Monthly Water Quality Surveys includes profiling of the water column in the Harbor using a remote sensing package, collecting discrete water samples for ammonia, BOD and indicator bacteria at sites throughout the Marina and at the mouth of Ballona Creek. These monthly surveys are intended to track compliance with specific regulatory requirements or limits, to conduct ongoing assessments, or to track trends in certain important conditions over time.

Semiannual Fish Surveys includes sampling, identification and reporting of the fish population in the Marina using three sampling techniques: trawling, gill nets, ichthyoplankton tows and beach seining.

Sediment Chemistry and Biological Surveys include collection of sediment grab samples for chemistry and biology throughout the Marina at specified sampling locations. Chemistry samples are analyzed for metals and organic constituents. Biota are identified to the lowest possible taxa. Each of these datasets are used to assess the environmental condition of the Marina over time.

Constituents to be Monitored and Measurement Techniques

Water quality measurements, sediment chemistry and marine fish and infauna population surveys will be used to assess the condition of the Harbor. We will use existing EPA, SWAMP, and Southern California Regional Monitoring protocols.

Table 1. (Element 6) Analytical constituents and method requirements.

Sediment Chemistry

Parameter	Units	MDL	RL	Method
Non-Metallic Contaminants and Metals				
Total Volatile Solids	% Dry Wei	0.1	0.2	SM 2540-E
Immediate Oxygen Demand	mg/L	0.01	1	SM 4500-O G
Chemical Oxygen Demand	mg/kg	2	100	EPA 410.1M
Total Organic Carbon	%	0.01	0.03	EPA 9060A
Oil & Grease	Percent	2	10	EPA 1664
Orthophosphate PO4	mg/L	0.01	0.05	SM 4500-P C
Organic Nitrogen (TKN)	µg/dry g	1	10	EPA 351,3M
Acid Volatile Sulfides	mg/dry kg	0.05	0.1	Plumb, 1981 and TERL
Ammonia-N	mg/L	0.01	0.05	SM 4500-NH3 F
Arsenic (As)	µg/dry g	0.025	0.05	EPA 6020
Cadmium (Cd)	µg/dry g	0.025	0.05	EPA 6020
Chromium (Cr)	µg/dry g	0.025	0.05	EPA 6020
Copper (Cu)	µg/dry g	0.025	0.05	EPA 6020
Iron (Fe)	µg/dry g	1	5	EPA 6020
Lead (Pb)	µg/dry g	0.025	0.05	EPA 6020
Manganese (Mn)	µg/dry g	0.025	0.05	EPA 6020
Mercury (Hg)	µg/dry g	0.005	0.01	EPA 6020
Nickel (Ni)	µg/dry g	0.025	0.05	EPA 6020
Tributyltin	ng/dry g	1	3	Krone et al., 1989
Zinc (Zn)	µg/dry g	0.025	0.05	EPA 6020
LA County Stormwater Measurements				
Calcium (Ca)	µg/dry g	1	10	EPA 6020
Potassium	µg/dry g			EPA 6020
Sodium (Na)	µg/dry g	1	5	EPA 6020
Chloride	mg/L	0.01	0.05	SM 4500-Cl E
Barium (Ba)	µg/dry g	0.025	0.05	EPA 6020
Selenium (Se)	µg/dry g	0.025	0.05	EPA 6020
Silver (Ag)	µg/dry g	0.025	0.05	EPA 6020
Fluoride	mg/L	0.01	0.05	SM 4500-F D
Nitrate-N	mg/L	0.01	0.05	SM 4500-NO3
Nitrite-N	mg/L	0.01	0.05	SM 4500-NO2 B
Sulfate	mg/L	0.01	0.05	SM 4500-SO4 F
Total Alkalinity	mg/L	1	5	SM 2320 B
Total Hardness as CaCO3	mg/kg	1	5	SM 2340-B
Boron (B)	mg/L	0.025	0.05	EPA 6020
Conductivity	mS			SM 2510
Total Dissolved Solids	mg/L			SM 2450-C
Percent Solids = Total Sus Solids	Percent	0.1	0.1	EPA 160.3

Parameter	Units	MDL	RL	Method
Pesticides and Chlorinated Hydrocarbons				
2,4'-DDD	ng/dry g	1	5	EPA 8270C
2,4'-DDE	ng/dry g	1	5	EPA 8270C
2,4'-DDT	ng/dry g	1	5	EPA 8270C
4,4'-DDD	ng/dry g	1	5	EPA 8270C
4,4'-DDE	ng/dry g	1	5	EPA 8270C
4,4'-DDT	ng/dry g	1	5	EPA 8270C
Total Detectable DDTs	ng/dry g			EPA 8270C
Aldrin	ng/dry g	1	5	EPA 8270C
BHC-alpha	ng/dry g	1	5	EPA 8270C
BHC-beta	ng/dry g	1	5	EPA 8270C
BHC-delta	ng/dry g	1	5	EPA 8270C
BHC-gamma	ng/dry g	1	5	EPA 8270C
Chlordane-alpha	ng/dry g	1	5	EPA 8270C
Chlordane-gamma	ng/dry g	1	5	EPA 8270C
Dieldrin	ng/dry g	1	5	EPA 8270C
Endosulfan Sulfate	ng/dry g	1	5	EPA 8270C
Endosulfan-I	ng/dry g	1	5	EPA 8270C
Endosulfan-II	ng/dry g	1	5	EPA 8270C
Endrin	ng/dry g	1	5	EPA 8270C
Endrin Aldehyde	ng/dry g	1	5	EPA 8270C
Endrin Ketone	ng/dry g	1	5	EPA 8270C
Heptachlor	ng/dry g	1	5	EPA 8270C
Heptachlor Epoxide	ng/dry g	1	5	EPA 8270C
Methoxychlor	ng/dry g	1	5	EPA 8270C
Mirex	ng/dry g	1	5	EPA 8270C
Toxaphene	ng/dry g	10	50	EPA 8270C
trans-Nonachlor	ng/dry g	1	5	EPA 8270C
Aroclor 1016	ng/dry g	10	20	EPA 8270C
Aroclor 1221	ng/dry g	10	20	EPA 8270C
Aroclor 1232	ng/dry g	10	20	EPA 8270C
Aroclor 1242	ng/dry g	10	20	EPA 8270C
Aroclor 1248	ng/dry g	10	20	EPA 8270C
Aroclor 1254	ng/dry g	10	20	EPA 8270C
Aroclor 1260	ng/dry g	10	20	EPA 8270C

Analyte	Method
Water Quality Profiles	
Dissolved oxygen	SCCWRP (2003)*
pH	SCCWRP (2003)
Salinity	SCCWRP (2003)
Temperature	SCCWRP (2003)
% light transmissance	SCCWRP (2003)
Light transparency	SCCWRP (2003)
Water color by Forel	SCCWRP (2003)
5 Day BOD	EPA 405.1
NH3	SM 4500-NH3 F
Indicator Bacteria	
Total Coliform and E. coli in Water Analysis by Colilert	Colilert
Enterococcus in Water Analysis by Enterolert	Enterolert
Bioassessments	
Marine	SCCWRP (2003)*

* Southern California Regional Monitoring Program, 2003 Field and Laboratory Operating Procedures, Southern California Coastal Water Research Project.

QUALITY OBJECTIVES AND CRITERIA

7.1 Data Quality Objectives

Measurement or Analyses Type	Applicable Data Quality Objective
Field Measurements	Accuracy, Precision, Completeness
Bacterial Analyses	Precision, Presence/Absence, Completeness
Trace Metals Analyses	Accuracy, Precision, Recovery, Completeness
Synthetic Organic Analyses	Accuracy, Precision, Recovery, Completeness
Organics Sediment Analyses	Accuracy, Precision, Recovery, Completeness
Conventional Analyses	Accuracy, Precision, Recovery, Completeness

Accuracy describes how close the measurement is to its true value. Accuracy is the measurement of a sample of known concentration and comparing the known value against the measured value. The accuracy of chemical measurements will be checked by performing tests on standards prior to and/or during sample analysis at the CRG. A standard is a known concentration of a certain solution. Standards can be purchased from chemical or scientific supply companies. Standards might also be prepared by a professional partner, e.g. a commercial or research laboratory. The concentration of the standards will be unknown to the analyst until after measurements are determined. Accuracy criteria for bacterial testing will be based on presence/absence testing rather than numerical limits owing to the difficulty in preparing solutions of known bacterial concentration. The reliability of toxicity testing results depends on the quality of test organisms, testing conditions and the expertise of laboratory personnel. For each test organism there are numerous test conditions and reference toxicant criteria that must be met before the result can be accepted. A brief description of the criteria used to ensure the quality of toxicity test results are provided below. More detailed summaries can be found in the EPA protocols for Ceriodaphnia dubia (EPA/821/R/02012), Menidia beryllina (EPA/821/R/02012) and Eohaustorius sp. (EPA/R-94/025).

The precision objectives apply to duplicate and split samples taken during field sampling and laboratory analysis as part of periodic QC checks. Precision describes how well repeated measurements agree. The evaluation of precision described here relates to repeated measurements/samples taken in the field (i.e. field replicates) or the laboratory. The precision objectives for toxicity testing apply to laboratory reference toxicant tests and EPA DMR studies. Reference toxicant results for each species should fall within ± 2 SD of the mean of the preceding 20 tests. A reference toxicant test is run with each batch of test samples.

Recovery measurements will be determined by laboratory spiking of a replicate sample with a known concentration of the analyte. The spike level should be at least ten times the MDL.

Completeness is the fraction of planned data that must be collected in order to fulfill the statistical criteria of the project. There are no statistical criteria that require a certain percentage of data. However, it is expected that 90% of all measurements could be taken when anticipated. This accounts for adverse weather conditions, safety concerns, and equipment problems. We will determine completeness by comparing the number of measurements we planned to collect compared to the number of measurements we actually collected that were also deemed valid. An invalid measurement would be one that does not meet the sampling methods requirements and the data quality objectives. Completeness results will be checked quarterly. This will allow us to identify and correct problems.

Method sensitivity is dealt with by the inclusion of the required SWAMP Target Reporting Limits, where such values exist, and by the application of the definition of a Minimum Level as provided by the Inland Surface Water and Enclosed Bays and Estuaries Policy. Target Reporting Limits exist for the metals copper, and iron; and for total coliforms and fecal coliforms. The Target Reporting Limit for hardness was set based on the smallest measurable amount of EDTA titrant and sample volume routinely used, although no sample is expected to be non-detect for hardness. The reporting level for acute toxicity tests is dependent on the sample dilutions tested. In this study, we will be using 100% sample compared to a laboratory dilution water control. Therefore, results could be reported from 0 to 100% survival.

7.2 Field and Laboratory Measurements Data Quality Objectives Tables

Table 2. (Element 7) Data quality objectives for field measurements.

Group	*Parameter*	*Accuracy*	*Precision*	*Recovery*	*Target Reporting Limit*	*Completeness*
Field testing	Dissolved Oxygen	± 0.5 mg/L	10%	NA	0 mg/L	90%
	Temperature	± 0.5 °C	5%	NA	-5 °C	90%
	Conductivity	± 5%	5%	NA	0-100mS/cm	90%
	pH by meter	± 0.5 units	5%	NA	2-12	90%

NA not applicable

Table 3. (Element 7) Data quality objectives for laboratory measurements.

Group	*Parameter*	*Accuracy*	*Precision*	*Recovery*	*Target Reporting Limits*	*Units*	*Completeness*
Conventional constituents in water	Ammonia	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 80% to 120% of true value	Laboratory duplicate, Blind Field duplicate, or MS/MSD 25% RPD Laboratory duplicate minimum.	Matrix spike 80% - 120% or control limits at ± 3 standard deviations based on actual lab data.	0.05	mg/L	90%
	Dissolved				0.05	mg/L	
	Nitrate				0.05	mg/L	
	Nitrite				0.05	mg/L	
	pH				0.2	pH Unit	
	Total Alkalinity				5	mg/L	
	Total Hardness				5	mg/L	
	Total Kjeldahl Nitrogen				0.5	mg/L	
	Total Organic Carbon				0.5	mg/L	
	Total Orthophosphate				0.01	mg/L	
	Total Phosphorus				0.05	mg/L	
	Total Suspended Solids				5	mg/L	
Conventional constituents in estuary seawater	Ammonia	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 80% to 120% of true value	Laboratory duplicate, Blind Field duplicate, or MS/MSD 25% RPD Laboratory duplicate minimum.	Matrix spike 80% - 120% or control limits at ± 3 standard deviations based on actual lab data.	0.05	mg/L	90%
	Dissolved				0.05	mg/L	
	Nitrate				0.05	mg/L	
	Nitrite				0.05	mg/L	
	pH				0.2	pH Unit	
	Total Alkalinity				5	mg/L	
	Total Hardness				5	mg/L	
	Total Kjeldahl Nitrogen				0.5	mg/L	
	Total Organic Carbon				1.0	mg/L	
	Total Orthophosphate				0.01	mg/L	
	Total Phosphorus				0.05	mg/L	
	Total Suspended Solids				5	mg/L	
Trace Metals in water	Aluminum (Al)	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 75% to 125% of true value	Field replicate, laboratory duplicate, or MS/MSD ± 25% RPD. Laboratory duplicate minimum.	Matrix spike 75% - 125%.	10.0	µg/L	90%
	Antimony (Sb)				0.5	µg/L	
	Arsenic (As)				0.5	µg/L	
	Barium (Ba)				0.5	µg/L	
	Beryllium (Be)				0.5	µg/L	
	Cadmium (Cd)				0.4	µg/L	
	Chromium (Cr)				0.5	µg/L	
	Cobalt (Co)				0.5	µg/L	
	Copper (Cu)				0.8	µg/L	
	Iron (Fe)				10.0	µg/L	
	Lead (Pb)				0.5	µg/L	
	Manganese (Mn)				0.5	µg/L	
	Mercury (Hg)				0.02	µg/L	
	Molybdenum (Mo)				0.5	µg/L	
	Nickel (Ni)				0.5	µg/L	
	Selenium (Se)				0.5	µg/L	
	Silver (Ag)				1	µg/L	
	Strontium (Sr)				0.5	µg/L	
	Thallium (Tl)				0.5	µg/L	
	Tin (Sn)				0.5	µg/L	
	Titanium (Ti)				0.5	µg/L	
	Vanadium (V)				0.5	µg/L	
	Zinc (Zn)				0.5	µg/L	

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Units	Completeness
Trace Metals in estuary seawater	Aluminum (Al) Antimony (Sb) Arsenic (As) Beryllium (Be) Cadmium (Cd) Chromium (Cr) Cobalt (Co) Copper (Cu) Iron (Fe) Lead (Pb) Manganese (Mn) Mercury (Hg) Molybdenum (Mo) Nickel (Ni) Selenium (Se) Silver (Ag) Thallium (Tl) Tin (Sn) Titanium (Ti) Vanadium (V) Zinc (Zn)	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 75% to 125% of true value	Field replicate, laboratory duplicate, or MS/MSD ± 25% RPD. Laboratory duplicate minimum.	Matrix spike 75% - 125%.	6.0 0.015 0.02 0.01 0.01 0.05 0.01 0.02 1.0 0.01 0.02 0.02 0.01 0.01 0.02 0.04 0.01 0.01 0.07 0.04 0.01	µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L µg/L	90%
Nutrients in estuary sediments	Total Kjeldahl Nitrogen Total Organic Carbon Total Phosphorus	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 80% to 120% of true value	Laboratory duplicate, Blind Field duplicate, or MS/MSD 25%. RPD Laboratory duplicate minimum.	Matrix spike 80% - 120% or control limits at ± 3 standard deviations based on actual lab data.	0.50 0.05 0.05	mg/L % Dry Weight mg/L	90%
Trace metals in estuary sediments	Aluminum (Al) Antimony (Sb) Arsenic (As) Barium (Ba) Beryllium (Be) Cadmium (Cd) Chromium (Cr) Cobalt (Co) Copper (Cu) Iron (Fe) Lead (Pb) Manganese (Mn) Mercury (Hg) Molybdenum (Mo) Nickel (Ni) Selenium (Se) Silver (Ag) Strontium (Sr) Thallium (Tl) Tin (Sn) Titanium (Ti) Vanadium (V) Zinc (Zn)	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 75% to 125% of true value	Field replicate, laboratory duplicate, or MS/MSD 30% RPD. Laboratory duplicate	Matrix spike 75% - 125%.	5 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 5 0.05 0.05 0.02 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	µg/dry g µg/dry g	90%

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Units	Completeness
Organophosphorus Pesticides in estuary sediment	Bolstar (Sulprofos)	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 50% to 150% of true value	Field replicate or MS/MSD ± 25% RPD. Field replicate minimum.	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	10	ng/dry g	90%
	Chlorpyrifos				10	ng/dry g	
	Demeton				10	ng/dry g	
	Diazinon				10	ng/dry g	
	Dichlorvos				10	ng/dry g	
	Dimethoate				10	ng/dry g	
	Disulfoton				10	ng/dry g	
	Ethoprop (Ethoprofos)				10	ng/dry g	
	Fenchlorophos (Ronnel)				10	ng/dry g	
	Fensulfothion				10	ng/dry g	
	Fenthion				10	ng/dry g	
	Malathion				10	ng/dry g	
	Merphos				10	ng/dry g	
	Methyl Parathion				10	ng/dry g	
	Mevinphos (Phosdrin)				10	ng/dry g	
	Phorate				10	ng/dry g	
	Tetrachlorvinphos (Stirofos)				10	ng/dry g	
	Tokuthion				10	ng/dry g	
	Trichloronate				10	ng/dry g	
Organochlorine Pesticides & PCBs in estuary sediment	4,4'-DDD	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 50% to 150% of true value	Field replicate or MS/MSD ± 25% RPD. Field replicate minimum.	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	5	ng/dry g	90%
	2,4'-DDD				5	ng/dry g	
	2,4'-DDE				5	ng/dry g	
	2,4'-DDT				5	ng/dry g	
	4,4'-DDE				5	ng/dry g	
	4,4'-DDT				5	ng/dry g	
	Aldrin				5	ng/dry g	
	BHC-alpha				5	ng/dry g	
	BHC-beta				5	ng/dry g	
	BHC-delta				5	ng/dry g	
	BHC-gamma				5	ng/dry g	
	Chlordane-alpha				5	ng/dry g	
	Chlordane-gamma				5	ng/dry g	
	cis-Nonachlor				5	ng/dry g	
	Dieldrin				5	ng/dry g	
	Endosulfan Sulfate				5	ng/dry g	
	Endosulfan-I				5	ng/dry g	
	Endosulfan-II				5	ng/dry g	
	Endrin				5	ng/dry g	
	Endrin Ketone				5	ng/dry g	
	Heptachlor				5	ng/dry g	
	Heptachlor Epoxide				5	ng/dry g	
	Methoxychlor				5	ng/dry g	
	Mirex				5	ng/dry g	
	Oxychlordane				5	ng/dry g	
	trans-Nonachlor				5	ng/dry g	
	Endrin Aldehyde				5	ng/dry g	
	Toxaphene				50	ng/dry g	
	PCB018				5	ng/dry g	
	PCB028				5	ng/dry g	
	PCB031				5	ng/dry g	
	PCB033				5	ng/dry g	
	PCB037				5	ng/dry g	

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Units	Completeness
Organochlorine Pesticides & PCBs in estuary sediment (continued)	PCB044				5	ng/dry g	
	PCB049				5	ng/dry g	
	PCB052				5	ng/dry g	
	PCB066				5	ng/dry g	
	PCB070				5	ng/dry g	
	PCB074				5	ng/dry g	
	PCB077				5	ng/dry g	
	PCB081				5	ng/dry g	
	PCB087				5	ng/dry g	
	PCB095				5	ng/dry g	
	PCB097				5	ng/dry g	
	PCB099				5	ng/dry g	
	PCB101				5	ng/dry g	
	PCB105				5	ng/dry g	
	PCB110				5	ng/dry g	
	PCB114				5	ng/dry g	
	PCB118				5	ng/dry g	
	PCB119				5	ng/dry g	
	PCB123				5	ng/dry g	
	PCB126				5	ng/dry g	
	PCB128+167				5	ng/dry g	
	PCB138				5	ng/dry g	
	PCB141				5	ng/dry g	
	PCB149				5	ng/dry g	
	PCB153				5	ng/dry g	
	PCB156				5	ng/dry g	
	PCB157				5	ng/dry g	
	PCB158				5	ng/dry g	
	PCB168				5	ng/dry g	
	PCB168+132				5	ng/dry g	
	PCB169				5	ng/dry g	
	PCB170				5	ng/dry g	
	PCB177				5	ng/dry g	
	PCB180				5	ng/dry g	
	PCB183				5	ng/dry g	
	PCB187				5	ng/dry g	
	PCB189				5	ng/dry g	
	PCB194				5	ng/dry g	
	PCB200				5	ng/dry g	
	PCB201				5	ng/dry g	
	PCB206				5	ng/dry g	

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Units	Completeness
Polynuclear Aromatic Hydrocarbons in estuary sediment	1-Methylnaphthalene 1-Methylphenanthrene 2,3,5-Trimethylnaphthalene 2,6-Dimethylnaphthalene 2-Methylnaphthalene Acenaphthene Acenaphthylene Anthracene Benz[a]anthracene Benzo[a]pyrene Benzo[b]fluoranthene Benzo[e]pyrene Benzo[g,h,i]perylene Benzo[k]fluoranthene Biphenyl Chrysene Dibenz[a,h]anthracene Dibenzothiophene Fluoranthene Fluorene Indeno[1,2,3-c,d]pyrene Naphthalene Perylene Phenanthrene Pyrene	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 50% to 150% of true value	Field replicate or MS/MSD ± 25% RPD. Field replicate minimum.	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	ng/dry g ng/dry g	90%
Sediment grain size in estuary sediments	Sediment grain size	± 5% of point standard	Replicates within ± 20%	N/A	gravel sand silt clay	% % % %	90%
Trace Metals in Tissues	Aluminum (Al) Antimony (Sb) Arsenic (As) Barium (Ba) Beryllium (Be) Cadmium (Cd) Chromium (Cr) Cobalt (Co) Copper (Cu) Iron (Fe) Lead (Pb) Manganese (Mn) Mercury (Hg) Molybdenum (Mo) Nickel (Ni) Selenium (Se) Silver (Ag) Strontium (Sr) Thallium (Tl) Tin (Sn) Titanium (Ti) Vanadium (V) Zinc (Zn)	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 75% to 125% of true value	Field replicate, laboratory duplicate, or MS/MSD 30% RPD. Laboratory duplicate	Matrix spike 75% - 125%.	5 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 5 0.05 0.05 0.02 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	µg/wet g µg/wet g	90%

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Units	Completeness
Organochlorine pesticides & PCBs in tissues	4,4'-DDD	Standard Reference Materials (SRM, CRM) or Lab Control Spikes (LCS) within 95% CL stated by provider of material. If not available then with 50% to 150% of true value	Field replicate or MS/MSD ± 25% RPD. Field replicate minimum.	Matrix spike 50% - 150% or control limits at ± 3 standard deviations based on actual lab data.	5	ng/wet g	90%
	2,4'-DDD				5	ng/wet g	
	2,4'-DDE				5	ng/wet g	
	2,4'-DDT				5	ng/wet g	
	4,4'-DDE				5	ng/wet g	
	4,4'-DDT				5	ng/wet g	
	Aldrin				5	ng/wet g	
	BHC-alpha				5	ng/wet g	
	BHC-beta				5	ng/wet g	
	BHC-delta				5	ng/wet g	
	BHC-gamma				5	ng/wet g	
	Chlordane-alpha				5	ng/wet g	
	Chlordane-gamma				5	ng/wet g	
	cis-Nonachlor				5	ng/wet g	
	Dieldrin				5	ng/wet g	
	Endosulfan Sulfate				5	ng/wet g	
	Endosulfan-I				5	ng/wet g	
	Endosulfan-II				5	ng/wet g	
	Endrin				5	ng/wet g	
	Endrin Ketone				5	ng/wet g	
	Heptachlor				5	ng/wet g	
	Heptachlor Epoxide				5	ng/wet g	
	Methoxychlor				5	ng/wet g	
	Mirex				5	ng/wet g	
	Oxychlordane				5	ng/wet g	
	trans-Nonachlor				5	ng/wet g	
	Endrin Aldehyde				5	ng/wet g	
	Toxaphene				5	ng/wet g	
	PCB018				5	ng/wet g	
	PCB028				5	ng/wet g	
	PCB031				5	ng/wet g	
	PCB033				5	ng/wet g	
	PCB037				5	ng/wet g	
	PCB044				5	ng/wet g	
	PCB049				5	ng/wet g	
	PCB052				5	ng/wet g	
	PCB066				5	ng/wet g	
	PCB070				5	ng/wet g	
	PCB074				5	ng/wet g	
	PCB077				5	ng/wet g	
	PCB081				5	ng/wet g	
	PCB087				5	ng/wet g	
	PCB095				5	ng/wet g	
	PCB097				5	ng/wet g	
	PCB099				5	ng/wet g	
	PCB101				5	ng/wet g	
	PCB105				5	ng/wet g	

Group	Parameter	Accuracy	Precision	Recovery	Target Reporting Limits	Units	Completeness
Organochlorine pesticides & PCBs in tissues (continued)	PCB110				5	ng/wet g	
	PCB114				5	ng/wet g	
	PCB118				5	ng/wet g	
	PCB119				5	ng/wet g	
	PCB123				5	ng/wet g	
	PCB126				5	ng/wet g	
	PCB128+167				5	ng/wet g	
	PCB138				5	ng/wet g	
	PCB141				5	ng/wet g	
	PCB149				5	ng/wet g	
	PCB153				5	ng/wet g	
	PCB156				5	ng/wet g	
	PCB157				5	ng/wet g	
	PCB158				5	ng/wet g	
	PCB168				5	ng/wet g	
	PCB168+132				5	ng/wet g	
	PCB169				5	ng/wet g	
	PCB170				5	ng/wet g	
	PCB177				5	ng/wet g	
	PCB180				5	ng/wet g	
	PCB183				5	ng/wet g	
	PCB187				5	ng/wet g	
	PCB189				5	ng/wet g	
	PCB194				5	ng/wet g	
	PCB200				5	ng/wet g	
	PCB201				5	ng/wet g	
	PCB206				5.00	ng/wet g	
Percent Lipids in Tissues	Lipids	N/A	Laboratory duplicate, Blind Field duplicate, or MS/MSD 25% RPD Laboratory duplicate minimum.	N/A	0.05	Percent	90%

Table 8. Data Quality Objectives for biological laboratory analyses.

Group	*Parameter*	*Accuracy*	*Precision*	*Recovery*	*Target Reporting Limits*	*Units*	*Completeness*
Bacterial analysis in water and estuary waters	Total Coliforms E. Coli Enterococcus	Laboratory positive and negative cultures – proper positive or negative response. Bacterial sample - –within the stated acceptance criteria.	R_{log} within 3.27*mean R_{log} (reference is section 9020B of 18th, 19th, or 20th editions of *Standard Methods*	N/A	10	MPN/100 mL	90%
Toxicity Testing: water & sediment	Acute Chronic	N/A	Ref Tox ± 2 SD of preceding 20 tests	N/A	0 to 100%	% survival % reproduction % normal development	90%
Bioassessment	Benthic macroinvertebrate identification	Re-sort Frequency: 100% Re-sort Accuracy: > 95% Lab ID Frequency: 10% Lab ID Accuracy: > 95%	Field Duplicates: 5% ± 25% RPD	N/A	SAFIT	N/A	90%

Special Training Needs/Certification

Specialized Training or Certifications

The Aquatic Bioassay and Consulting Laboratories field staff have completed all applicable training to conduct bioassessment, toxicity, water quality, bacteriological and fish sampling. Aquatic Bioassay and CRG hold certifications for analysis of all the constituents. The Aquatic Bioassay and CRG QA officers provide training to their respective personnel and details of the training are described in the attached Standard Operating Procedures and Quality Assurance Program Documents attached.

Scott Johnson and Karin Wisenbaker will coordinate training of project personnel. Actual field training and day-to-day supervision is the responsibility of Scott Johnson. Standard Operating Procedures (SOPs) for field, laboratory, and data management tasks will be developed and updated on a regular basis in order to maintain procedural consistency.

No formal certifications are available for either field sampling or laboratory analysis.

Training and Certification Documentation

Aquatic Bioassay and Consulting Laboratories and CRG Labs maintain records of their training. Those records can be obtained, if needed, through the Project or Laboratory Directors.

Training Personnel

Aquatic Bioassay and Consulting Laboratories and CRG Labs maintain rigorous field and laboratory training programs based on written, oral and performance-based guidelines. Training and performance are also evaluated on an ongoing basis based, in part, on the QA parameters defined in this plan. Standard Operating Procedures (SOPs) for field, laboratory, and data management tasks have been developed and will be updated on a regular basis in order to maintain procedural consistency (see Appendices). The maintenance of an SOP Manual will provide project personnel with a reference guide for training new personnel as well as a standardized information source that personnel can access.

To ensure consistent and comparable field techniques, this study will include a pre-survey field training and in-situ field audits.

DOCUMENTS AND RECORDS

All documents generated by this project will be stored at Aquatic Bioassay during the life of the contract (Table 6). Documents will be transferred to the Department following completion of the contract. Sampling records will be stored and maintained at Aquatic Bioassay. Laboratory analysis records pertinent to this study will be maintained at Aquatic Bioassay. Copies of all records held by CRG Labs or Normandeau will be provided to the Project QA Officer or Project Director upon request.

Persons responsible for maintaining records for this project are as follows. Karin Wisenbaker will maintain all sample collection, sample transport, chain of custody, field analyses forms, all records associated with the receipt and analysis of samples analyzed for all parameters, and all records submitted by CRG Labs. Rich Gossett will maintain CRG Labs records including sediment and water chemistry chains of custody and bench sheets. Melinda Sweeny will maintain the lab sheets associated with ichthyoplankton identifications. Scott Johnson will oversee the actions of these persons and will arbitrate any issues relative to records retention and any decisions to discard records.

All field results will be recorded at the time of completion, using standardized field data sheets. Data sheets will be reviewed for outliers and omissions before leaving the sample site. Chain of custody forms will be completed for all samples before leaving each sampling site. Data sheets and chains of custody will be stored by Aquatic Bioassay in hard copy form for five years from the time the study is completed. The directory where electronic files are stored will be backed up nightly on a second hard drive, and backed up monthly off-site.

All data from this project will be made publicly available after approval by the Department. The final electronic version of the database will be maintained by Department. Release of data to the public will be in electronic formats only and will include comprehensive documentation. This documentation will include database table structures (including table relationships) and lookup tables used to populate specific fields in specific tables. Release to the public will also include quality assurance classifications of the data (i.e. flags, as appropriate) and documentation of the methods by which the data were collected (metadata). Data will be released to the general public once a final report documenting the study has been prepared. Final deposition of databases and reports will be passed to the Project Director and Contract Manager on CD.

Table 4. (Element 9) Document and record retention, archival, and disposition information.

	Identify Type Needed	Retention	Archival	Disposition
Station Occupation Log	Notebook	Paper	Notebook	5 years
	Field data sheet	Paper	Notebook	5 years
Sample Collection Records	Chain of Custody	Paper	Notebook	5 years
Analytical Records	Lab notebooks	Paper	Notebook	3 years
	Lab Results QA/QC	Paper and electronic	Notebook/Excel	3 years
	Electronic data file	Electronic	Database	3 years
Data Records	Data Entry	Electronic	Database	Indefinite
Assessment Records	QA/QC assessment	Paper and electronic	Document	Indefinite
	Final Report	Paper and electronic	Document	Indefinite

DATA GENERATION AND ACQUISITION

11. SAMPLING METHODS

See attached Standard Operating Procedures (SOPs) for sampling and laboratory analyses.

Sample Handling and Custody

Samples will be collected and transferred to the analytical laboratories within the holding times specified in Table 5. To provide for proper tracking and handling of the samples, documentation will accompany the samples from the initial collection to the final identification and analysis.

All bottles will be labeled according to the SOP in the Appendices. Field data sheets and chains of custody will accompany the collection of samples. An example of the Chain-of-Custody form is also shown in the Appendices.

All samples will be marked with a unique number to track their analysis. These identification labels will also be entered directly on to field and laboratory data sheets. All observations recorded in the field as well as information recorded in processing all field samples in the laboratory will be tracked using these identification labels.

The SOP details the procedures for submitting samples to Aquatic Bioassay. These procedures reinforce the use of proper sample containers, chain of custody procedures, and unique station codes and sampling agency identifiers.

Table 5. (Element 11) Sample handling.

Analyte	Bottle Type/Size	Preservative	Maximum Holding Time
Bioassessment	0.5 G Plastic wide mouth with screw top lids	95% Ethanol	5 years
Water Toxicity	1 gallon plastic wide mouth carboy	4 °C	36 hours
Sediment Toxicity	2 L wide mouth polyethylene containers	4 °C	14 days
Bacteriology	100 mL sterile plastic container	4 °C	6 hours
Water Chemistry			
Freshwater metals	250 mL HDPE plastic	4 °C	48 hours
Freshwater & seawater organics	2 L amber glass	4 °C	7 days/40 days
Seawater metals	1 L HDPE plastic	4 °C	48 hours
General Chemistry	250 mL HDPE Plastic *	4 °C	28 days **
Sediment & Tissue Chemistry: trace metals & general chemistry	50 g glass jar	4 °C	6 months
Sediment & Tissue Chemistry: organics	50 g glass jar	4 °C	40 days

* All except: DOC = 250 mL glass; DIC 40 mL VOA; TKN = 500 mL amber glass; TOC = 40 mL VOA; TSS = 1L HDPE plastic
** ALL EXCEPT: NITRATE/NITRITE & ORTHOPHOSPHATE = 48 HOURS; PH = ASAP/24 HOURS; ALKALINITY = 14 DAYS; TOTAL HARDNESS = 6 MONTHS; TSS = 7 DAYS

ANALYTICAL METHODS

Field Analysis Methods

Field measurements will have the accuracy as indicated below.

Table 6. (Element 13) Field analytical methods.

Analyte	*Laboratory / Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Method*		*Achievable Laboratory Limits*
				Analytical Method/ SOP	***Modified for Method yes/no***	***MDLs (1)***
Estuary water						
pH	Field monitoring	6 - 9 pH units	NA	SM 4500 H+B*	None	NA
Conductance	Same	NONE	NA	SM 2510 B*	None	NA
DO	Same	None	NA	SM 4500 OG*	None	NA
Temperature	Same	None	-5 ° C	SM 2550 B*	None	0.1 ° C

(*) Standard Methods for the Examination of Water and Wastewater, 20th edition.

Analysis Methods

The samples will be analyzed for chemistry as indicated below.

Table 7. (Element 13) Laboratory analytical methods.

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Conventional constituents in water	Ammonia	CRG	None	0.05 mg/L	SM4500-NH3 F	No
	Dissolved	CRG	None	0.05 mg/L	SM4500-NH3 F	No
	Nitrate	CRG	None	0.05 mg/L	EPA 300.0	No
	Nitrite	CRG	None	0.05 mg/L	EPA 300.0	No
	pH	CRG	None	0.2 pH Units	EPA 150.1	No
	Total Alkalinity	CRG	None	5 mg/L	SM2320B	No
	Total Hardness	CRG	None	5 mg/L	SM2340B	No
	Total Kjeldahl Nitrogen	CalScience	None	0.5 mg/L	EPA 351.3	No
	Total Organic Carbon	CalScience	None	0.5 mg/L	EPA 415.1	No
	Total Orthophosphate	CRG	None	0.01 mg/L	SM4500-P E	No
	Total Phosphorus	CRG	None	0.05 mg/L	SM4500-P C	No
	Total Suspended Solids	CRG	None	5 mg/L	SM2540D	No
Conventional constituents in estuary seawater	Ammonia	CRG	None	0.05 mg/L	SM4500-NH3 F	No
	Dissolved	CRG	None	0.05 mg/L	SM4500-NH3 F	No
	Nitrate	CRG	None	0.05 mg/L	EPA 300.0	No
	Nitrite	CRG	None	0.05 mg/L	EPA 300.0	No
	pH	CRG	None	0.2 pH Units	EPA 150.1	No
	Total Alkalinity	CRG	None	5 mg/L	SM2320B	No
	Total Hardness	CRG	None	5 mg/L	SM2340B	No
	Total Kjeldahl Nitrogen	CalScience	None	0.5 mg/L	EPA 351.3	No
	Total Organic Carbon	AMS	None	1.0 mg/L	EPA 415.1	No
	Total Orthophosphate	CRG	None	0.01 mg/L	SM4500-P E	No
	Total Phosphorus	CRG	None	0.05 mg/L	SM4500-P C	No
	Total Suspended Solids	CRG	None	5 mg/L	SM2540D	No
Trace Metals in water	Aluminum (Al)	CRG	None	10 µg/L	EPA 200.8	No
	Antimony (Sb)	CRG	None	0.5 µg/L	EPA 200.8	No
	Arsenic (As)	CRG	None	0.5 µg/L	EPA 200.8	No
	Barium (Ba)	CRG	None	0.5 µg/L	EPA 200.8	No
	Beryllium (Be)	CRG	None	0.5 µg/L	EPA 200.8	No
	Cadmium (Cd)	CRG	None	0.4 µg/L	EPA 200.8	No
	Chromium (Cr)	CRG	None	0.5 µg/L	EPA 200.8	No
	Cobalt (Co)	CRG	None	0.5 µg/L	EPA 200.8	No
	Copper (Cu)	CRG	None	0.8 µg/L	EPA 200.8	No
	Iron (Fe)	CRG	None	10 µg/L	EPA 200.8	No
	Lead (Pb)	CRG	None	0.1 µg/L	EPA 200.8	No
	Manganese (Mn)	CRG	None	0.5 µg/L	EPA 200.8	No
	Mercury (Hg)	CRG	None	0.02 µg/L	EPA 1631	No
	Molybdenum (Mo)	CRG	None	0.5 µg/L	EPA 200.8	No
	Nickel (Ni)	CRG	None	0.5 µg/L	EPA 200.8	No
	Selenium (Se)	CRG	None	0.5 µg/L	EPA 200.8	No

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Trace Metals in water (cont)	Silver (Ag)	CRG	None	1 µg/L	EPA 200.8	No
	Strontium (Sr)	CRG	None	0.5 µg/L	EPA 200.8	No
	Thallium (Tl)	CRG	None	0.5 µg/L	EPA 200.8	No
	Tin (Sn)	CRG	None	0.5 µg/L	EPA 200.8	No
	Titanium (Ti)	CRG	None	0.5 µg/L	EPA 200.8	No
	Vanadium (V)	CRG	None	0.5 µg/L	EPA 200.8	No
	Zinc (Zn)	CRG	None	0.5 µg/L	EPA 200.8	No
Trace Metals in estuary seawater	Aluminum (Al)	CRG	None	10 µg/L	EPA 1640	No
	Antimony (Sb)	CRG	None	0.5 µg/L	EPA 1640	No
	Arsenic (As)	CRG	None	0.5 µg/L	EPA 1640	No
	Beryllium (Be)	CRG	None	0.5 µg/L	EPA 1640	No
	Cadmium (Cd)	CRG	None	0.4 µg/L	EPA 1640	No
	Chromium (Cr)	CRG	None	0.5 µg/L	EPA 1640	No
	Cobalt (Co)	CRG	None	0.5 µg/L	EPA 1640	No
	Copper (Cu)	CRG	None	0.8 µg/L	EPA 1640	No
	Iron (Fe)	CRG	None	10 µg/L	EPA 1640	No
	Lead (Pb)	CRG	None	0.1 µg/L	EPA 1640	No
	Manganese (Mn)	CRG	None	0.5 µg/L	EPA 1640	No
	Mercury (Hg)	CRG	None	0.02 µg/L	EPA 1631	No
	Molybdenum (Mo)	CRG	None	0.5 µg/L	EPA 1640	No
	Nickel (Ni)	CRG	None	0.5 µg/L	EPA 1640	No
	Selenium (Se)	CRG	None	0.5 µg/L	EPA 1640	No
	Silver (Ag)	CRG	None	1 µg/L	EPA 1640	No
	Thallium (Tl)	CRG	None	0.5 µg/L	EPA 1640	No
	Tin (Sn)	CRG	None	0.5 µg/L	EPA 1640	No
	Titanium (Ti)	CRG	None	0.5 µg/L	EPA 1640	No
	Vanadium (V)	CRG	None	0.5 µg/L	EPA 1640	No
	Zinc (Zn)	CRG	None	0.5 µg/L	EPA 1640	No
Nutrients in estuary sediments	Total Kjeldahl Nitrogen	CalScience	None	10 mg/kg	EPA 351.3	No
	Total Organic Carbon	AMS	None	0.01%	EPA 415.1	No
	Total Phosphorus	CRG	None	0.05 mg/kg	SM4500-P C	No
Trace metals in estuary sediments	Aluminum (Al)	CRG	None	5 µg/dry g	EPA 6020	No
	Antimony (Sb)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Arsenic (As)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Barium (Ba)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Beryllium (Be)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Cadmium (Cd)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Chromium (Cr)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Cobalt (Co)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Copper (Cu)	CRG	None	0.05 µg/dry g	EPA 6020	No

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Trace metals in estuary sediments (cont)	Iron (Fe)	CRG	None	5 µg/dry g	EPA 6020	No
	Lead (Pb)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Manganese (Mn)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Mercury (Hg)	CRG	None	0.02 µg/dry g	EPA 245.7	No
	Molybdenum (Mo)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Nickel (Ni)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Selenium (Se)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Silver (Ag)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Strontium (Sr)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Thallium (Tl)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Tin (Sn)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Titanium (Ti)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Vanadium (V)	CRG	None	0.05 µg/dry g	EPA 6020	No
	Zinc (Zn)	CRG	None	0.05 µg/dry g	EPA 6020	No
Organophosphorus Pesticides in estuary sediment	Bolstar (Sulprofos)	CRG	None	10 ng/dry g	EPA 8270C	No
	Chlorpyrifos	CRG	None	10 ng/dry g	EPA 8270C	No
	Demeton	CRG	None	10 ng/dry g	EPA 8270C	No
	Diazinon	CRG	None	10 ng/dry g	EPA 8270C	No
	Dichlorvos	CRG	None	10 ng/dry g	EPA 8270C	No
	Dimethoate	CRG	None	10 ng/dry g	EPA 8270C	No
	Disulfoton	CRG	None	10 ng/dry g	EPA 8270C	No
	Ethoprop (Ethoprofos)	CRG	None	10 ng/dry g	EPA 8270C	No
	Fenchlorophos (Ronnel)	CRG	None	10 ng/dry g	EPA 8270C	No
	Fensulfothion	CRG	None	10 ng/dry g	EPA 8270C	No
	Fenthion	CRG	None	10 ng/dry g	EPA 8270C	No
	Malathion	CRG	None	10 ng/dry g	EPA 8270C	No
	Merphos	CRG	None	10 ng/dry g	EPA 8270C	No
	Methyl Parathion	CRG	None	10 ng/dry g	EPA 8270C	No
	Mevinphos (Phosdrin)	CRG	None	10 ng/dry g	EPA 8270C	No
	Phorate	CRG	None	10 ng/dry g	EPA 8270C	No
	Tetrachlorvinphos (Stirofos)	CRG	None	10 ng/dry g	EPA 8270C	No
	Tokuthion	CRG	None	10 ng/dry g	EPA 8270C	No
	Trichloronate	CRG	None	10 ng/dry g	EPA 8270C	No
Organochlorine Pesticides & PCBs in estuary sediment	4,4'-DDD	CRG	None	1 ng/dry g	EPA 8270C	No
	2,4'-DDD	CRG	None	1 ng/dry g	EPA 8270C	No
	2,4'-DDE	CRG	None	1 ng/dry g	EPA 8270C	No
	2,4'-DDT	CRG	None	1 ng/dry g	EPA 8270C	No
	4,4'-DDE	CRG	None	1 ng/dry g	EPA 8270C	No
	4,4'-DDT	CRG	None	1 ng/dry g	EPA 8270C	No
	Aldrin	CRG	None	1 ng/dry g	EPA 8270C	No
	BHC-alpha	CRG	None	1 ng/dry g	EPA 8270C	No

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Organochlorine Pesticides & PCBs in estuary sediment (cont)	BHC-beta	CRG	None	1 ng/dry g	EPA 8270C	No
	BHC-delta	CRG	None	1 ng/dry g	EPA 8270C	No
	BHC-gamma	CRG	None	1 ng/dry g	EPA 8270C	No
	Chlordane-alpha	CRG	None	1 ng/dry g	EPA 8270C	No
	Chlordane-gamma	CRG	None	1 ng/dry g	EPA 8270C	No
	cis-Nonachlor	CRG	None	1 ng/dry g	EPA 8270C	No
	Dieldrin	CRG	None	1 ng/dry g	EPA 8270C	No
	Endosulfan Sulfate	CRG	None	1 ng/dry g	EPA 8270C	No
	Endosulfan-I	CRG	None	1 ng/dry g	EPA 8270C	No
	Endosulfan-II	CRG	None	1 ng/dry g	EPA 8270C	No
	Endrin	CRG	None	1 ng/dry g	EPA 8270C	No
	Endrin Ketone	CRG	None	1 ng/dry g	EPA 8270C	No
	Heptachlor	CRG	None	1 ng/dry g	EPA 8270C	No
	Heptachlor Epoxide	CRG	None	1 ng/dry g	EPA 8270C	No
	Methoxychlor	CRG	None	1 ng/dry g	EPA 8270C	No
	Mirex	CRG	None	1 ng/dry g	EPA 8270C	No
	Oxychlordane	CRG	None	1 ng/dry g	EPA 8270C	No
	trans-Nonachlor	CRG	None	1 ng/dry g	EPA 8270C	No
	Endrin Aldehyde	CRG	None	1 ng/dry g	EPA 8270C	No
	Toxaphene	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB018	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB028	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB031	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB033	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB037	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB044	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB049	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB052	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB066	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB070	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB074	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB077	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB081	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB087	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB095	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB097	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB099	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB101	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB105	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB110	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB114	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB118	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB119	CRG	None	1 ng/dry g	EPA 8270C	No

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Organochlorine Pesticides & PCBs in estuary sediment (cont)	PCB123	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB126	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB128+167	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB138	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB141	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB149	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB153	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB156	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB157	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB158	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB168	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB168+132	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB169	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB170	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB177	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB180	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB183	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB187	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB189	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB194	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB200	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB201	CRG	None	1 ng/dry g	EPA 8270C	No
	PCB206	CRG	None	1 ng/dry g	EPA 8270C	No
Polynuclear Aromatic Hydrocarbons in estuary sediment	1-Methylnaphthalene	CRG	None	1 ng/dry g	EPA 8270C	No
	1-Methylphenanthrene	CRG	None	1 ng/dry g	EPA 8270C	No
	2,3,5-Trimethylnaphthalene	CRG	None	1 ng/dry g	EPA 8270C	No
	2,6-Dimethylnaphthalene	CRG	None	1 ng/dry g	EPA 8270C	No
	2-Methylnaphthalene	CRG	None	1 ng/dry g	EPA 8270C	No
	Acenaphthene	CRG	None	1 ng/dry g	EPA 8270C	No
	Acenaphthylene	CRG	None	1 ng/dry g	EPA 8270C	No
	Anthracene	CRG	None	1 ng/dry g	EPA 8270C	No
	Benz[a]anthracene	CRG	None	1 ng/dry g	EPA 8270C	No
	Benzo[a]pyrene	CRG	None	1 ng/dry g	EPA 8270C	No
	Benzo[b]fluoranthene	CRG	None	1 ng/dry g	EPA 8270C	No
	Benzo[e]pyrene	CRG	None	1 ng/dry g	EPA 8270C	No
	Benzo[g,h,i]perylene	CRG	None	1 ng/dry g	EPA 8270C	No
	Benzo[k]fluoranthene	CRG	None	1 ng/dry g	EPA 8270C	No
	Biphenyl	CRG	None	1 ng/dry g	EPA 8270C	No
	Chrysene	CRG	None	1 ng/dry g	EPA 8270C	No
	Dibenz[a,h]anthracene	CRG	None	1 ng/dry g	EPA 8270C	No
	Dibenzothiophene	CRG	None	1 ng/dry g	EPA 8270C	No
	Fluoranthene	CRG	None	1 ng/dry g	EPA 8270C	No

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Polynuclear Aromatic Hydrocarbons in estuary sediment (cont)	Fluorene	CRG	None	1 ng/dry g	EPA 8270C	No
	Indeno[1,2,3-c,d]pyrene	CRG	None	1 ng/dry g	EPA 8270C	No
	Naphthalene	CRG	None	1 ng/dry g	EPA 8270C	No
	Perylene	CRG	None	1 ng/dry g	EPA 8270C	No
	Phenanthrene	CRG	None	1 ng/dry g	EPA 8270C	No
	Pyrene	CRG	None	1 ng/dry g	EPA 8270C	No
Sediment grain size in estuary sediments	Sediment grain size	ABC	None	N/A	SM 2560 C	No
Trace Metals in Tissues	Aluminum (Al)	CRG	None	5 µg/wet g	EPA 6020	No
	Antimony (Sb)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Arsenic (As)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Barium (Ba)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Beryllium (Be)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Cadmium (Cd)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Chromium (Cr)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Cobalt (Co)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Copper (Cu)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Iron (Fe)	CRG	None	5 µg/wet g	EPA 6020	No
	Lead (Pb)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Manganese (Mn)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Mercury (Hg)	CRG	None	0.02 µg/wet g	EPA 6020	No
	Molybdenum (Mo)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Nickel (Ni)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Selenium (Se)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Silver (Ag)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Strontium (Sr)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Thallium (Tl)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Tin (Sn)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Titanium (Ti)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Vanadium (V)	CRG	None	0.05 µg/wet g	EPA 6020	No
	Zinc (Zn)	CRG	None	0.05 µg/wet g	EPA 6020	No
Organochlorine Pesticides & PCBs in tissues	4,4'-DDD	CRG	None	1 ng/wet g	EA 8270C	No
	2,4'-DDD	CRG	None	1 ng/wet g	EA 8270C	No
	2,4'-DDE	CRG	None	1 ng/wet g	EA 8270C	No
	2,4'-DDT	CRG	None	1 ng/wet g	EA 8270C	No
	4,4'-DDE	CRG	None	1 ng/wet g	EA 8270C	No
	4,4'-DDT	CRG	None	1 ng/wet g	EA 8270C	No
	Aldrin	CRG	None	1 ng/wet g	EA 8270C	No
	BHC-alpha	CRG	None	1 ng/wet g	EA 8270C	No
	BHC-beta	CRG	None	1 ng/wet g	EA 8270C	No

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Organochlorine Pesticides & PCBs in tissues (cont)	BHC-delta	CRG	None	1 ng/wet g	EA 8270C	No
	BHC-gamma	CRG	None	1 ng/wet g	EA 8270C	No
	Chlordane-alpha	CRG	None	1 ng/wet g	EA 8270C	No
	Chlordane-gamma	CRG	None	1 ng/wet g	EA 8270C	No
	cis-Nonachlor	CRG	None	1 ng/wet g	EA 8270C	No
	Dieldrin	CRG	None	1 ng/wet g	EA 8270C	No
	Endosulfan Sulfate	CRG	None	1 ng/wet g	EA 8270C	No
	Endosulfan-I	CRG	None	1 ng/wet g	EA 8270C	No
	Endosulfan-II	CRG	None	1 ng/wet g	EA 8270C	No
	Endrin	CRG	None	1 ng/wet g	EA 8270C	No
	Endrin Ketone	CRG	None	1 ng/wet g	EA 8270C	No
	Heptachlor	CRG	None	1 ng/wet g	EA 8270C	No
	Heptachlor Epoxide	CRG	None	1 ng/wet g	EA 8270C	No
	Methoxychlor	CRG	None	1 ng/wet g	EA 8270C	No
	Mirex	CRG	None	1 ng/wet g	EA 8270C	No
	Oxychlordane	CRG	None	1 ng/wet g	EA 8270C	No
	trans-Nonachlor	CRG	None	1 ng/wet g	EA 8270C	No
	Endrin Aldehyde	CRG	None	1 ng/wet g	EA 8270C	No
	Toxaphene	CRG	None	1 ng/wet g	EA 8270C	No
	PCB018	CRG	None	1 ng/wet g	EA 8270C	No
	PCB028	CRG	None	1 ng/wet g	EA 8270C	No
	PCB031	CRG	None	1 ng/wet g	EA 8270C	No
	PCB033	CRG	None	1 ng/wet g	EA 8270C	No
	PCB037	CRG	None	1 ng/wet g	EA 8270C	No
	PCB044	CRG	None	1 ng/wet g	EA 8270C	No
	PCB049	CRG	None	1 ng/wet g	EA 8270C	No
	PCB052	CRG	None	1 ng/wet g	EA 8270C	No
	PCB066	CRG	None	1 ng/wet g	EA 8270C	No
	PCB070	CRG	None	1 ng/wet g	EA 8270C	No
	PCB074	CRG	None	1 ng/wet g	EA 8270C	No
	PCB077	CRG	None	1 ng/wet g	EA 8270C	No
	PCB081	CRG	None	1 ng/wet g	EA 8270C	No
	PCB087	CRG	None	1 ng/wet g	EA 8270C	No
	PCB095	CRG	None	1 ng/wet g	EA 8270C	No
	PCB097	CRG	None	1 ng/wet g	EA 8270C	No
	PCB099	CRG	None	1 ng/wet g	EA 8270C	No
	PCB101	CRG	None	1 ng/wet g	EA 8270C	No
	PCB105	CRG	None	1 ng/wet g	EA 8270C	No
	PCB110	CRG	None	1 ng/wet g	EA 8270C	No
	PCB114	CRG	None	1 ng/wet g	EA 8270C	No
	PCB118	CRG	None	1 ng/wet g	EA 8270C	No
	PCB119	CRG	None	1 ng/wet g	EA 8270C	No
	PCB123	CRG	None	1 ng/wet g	EA 8270C	No

Group	*Analyte*	*Laboratory/ Organization*	*Project Action Limit (units, wet or dry weight)*	*Project Quantitation Limit (units, wet or dry weight)*	*Analytical Methods*	
					Analytical Method/SOP	*Modified for Method yes/no*
Organochlorine Pesticides & PCBs in tissues (cont)	PCB126	CRG	None	1 ng/wet g	EA 8270C	No
	PCB128+167	CRG	None	1 ng/wet g	EA 8270C	No
	PCB138	CRG	None	1 ng/wet g	EA 8270C	No
	PCB141	CRG	None	1 ng/wet g	EA 8270C	No
	PCB149	CRG	None	1 ng/wet g	EA 8270C	No
	PCB153	CRG	None	1 ng/wet g	EA 8270C	No
	PCB156	CRG	None	1 ng/wet g	EA 8270C	No
	PCB157	CRG	None	1 ng/wet g	EA 8270C	No
	PCB158	CRG	None	1 ng/wet g	EA 8270C	No
	PCB168	CRG	None	1 ng/wet g	EA 8270C	No
	PCB168+132	CRG	None	1 ng/wet g	EA 8270C	No
	PCB169	CRG	None	1 ng/wet g	EA 8270C	No
	PCB170	CRG	None	1 ng/wet g	EA 8270C	No
	PCB177	CRG	None	1 ng/wet g	EA 8270C	No
	PCB180	CRG	None	1 ng/wet g	EA 8270C	No
	PCB183	CRG	None	1 ng/wet g	EA 8270C	No
	PCB187	CRG	None	1 ng/wet g	EA 8270C	No
	PCB189	CRG	None	1 ng/wet g	EA 8270C	No
	PCB194	CRG	None	1 ng/wet g	EA 8270C	No
	PCB200	CRG	None	1 ng/wet g	EA 8270C	No
	PCB201	CRG	None	1 ng/wet g	EA 8270C	No
	PCB206	CRG	None	1 ng/wet g	EA 8270C	No
Percent Lipids in Tissues	Lipids	CRG	None	0.10%	Gravimetric	No
Bacterial analysis in water and estuary waters	Total Coliforms	CRG	None	10 MPN/100mL	Colilert	No
	E. Coli	CRG	None	10 MPN/100mL	Colilert	No
	Enterococcus	CRG	None	10 MPN/100mL	Enterolert	No
Toxicity Testing: Water						
Freshwater	Ceriodaphnia: acute/chronic	ABC	None	0-100% survival; reproduction	EPA/821/R/02012	No
Estuary	Menidia: acute	ABC	None	0-100% survial	EPA/821/R/02012	No
Toxicity Testing: Estuary Sediments	Eohaustorius: acute	ABC	None	0-100% survival	EPA/R-94/025	No
	Mytilus: chronic	ABC	None	development	Marine Pollution Studies Lab, 2004	No
Bioassessment	Benthic macroinvertebrate identification	ABC	None	SAFIT QC	CSBP (2003) SCCWRP (2003)	No No

Sample Disposal

After analysis, including QA/QC procedures, sample disposal will follow laboratory protocols. Portions of the bioassessment samples will be retained including unsorted sample (1 year), sorted remnants (5 years), identified sample partitioned into taxa groups (5 years), and a reference collection (indefinitely).

Corrective Action

Corrective action is taken when an analysis is deemed suspect for some reason. These reasons include exceeding accuracy ranges (chemistry); not meeting test acceptability criteria or control chart criteria (toxicity); not meeting blank checks (bacteriology); and/or problems with sorting and identification (bioassessments). The corrective action will vary on a case-by-case basis, but at a minimum involves the following:

- A check of procedures.
- A review of documents and calculations to identify possible errors.
- Correction of errors based on discussions among analysts.
- A complete re-identification of the bioassessment sample.
- A re-analysis of the sample extract, if sufficient volume is available, to determine if results can be improved.
- A complete reprocessing and re-analysis of additional sample material, if sufficient volume is available and if the holding time has not been exceeded.
- Re-training of staff to ensure the action is not repeated.

The field and laboratory coordinators each have systems in place to document problems and make corrective actions. All corrective actions will be documented to the Project Manager.

Laboratories will be required to provide a three-week turnaround on all deliverables. The deliverable package will include hard copy and Electronic Data Deliverable (EDD). The hard copy will include standard narratives identifying any analytical or QA/QC problems and corrective actions, if any. The following QA/QC elements will be included in the data package: sample collection, extraction, and analysis dates and times, results of method blanks, summary of analytical accuracy, summary of analytical precision, and reporting limits. The electronic data files will contain all information found in the hard copy reports submitted by the laboratories. Individual data sets will be submitted as either Microsoft Excel® workbook files or as Microsoft Access® database files.

QUALITY CONTROL

Samples for QA/QC will be collected both in the field and in the lab. Field QA/QC samples are used to evaluate precision due to sampling bias or field variability. Field QA/QC samples include field duplicates and travel blanks. Lab QA/QC samples are used to evaluate the analytical process for precision and accuracy. Internal laboratory quality control checks will include:

- Bioassessments: sample re-sorts and re-identification
- Toxicity: acceptable laboratory controls and reference toxicant test results
- Bacteriology: acceptable laboratory blank and positive controls
- Chemistry: method blanks, laboratory control materials, duplicates, matrix spikes, instrument calibrations and internal standards

Field Sampling Quality Control

Quality assurance and quality control activities for sampling processes include the collection of field replicates for bacterial and chemical testing, the preparation of field blanks, and field checks by sampling staff (see Table 12). In order to monitor the sampling process, the Aquatic Bioassay Quality Assurance Officer will randomly observe sampling processes and compare the actual actions against the sampling SOP. Laboratory results will validate cleanliness of equipment. If contamination of sample by field or equipment occurs during the sampling, the contaminated sample will be discarded.

Travel blanks

Travel blanks will be used to insure that no contaminants are added during manual sampling operations and storage. Bottles will be filled prior to field activities and put on ice, taken into the field during sampling and transported to the lab for analysis.

Field Duplicates

Field duplicates help quantify potential bias associated with sampling activities. Field duplicates are comprised of a replicate sample taken at 5% of the programs sites. Each result will be recorded along with the average of the two results, the difference between the largest and smallest result, and the percent difference between the largest and smallest result. The percent difference will be calculated as follows.

Relative Percent Difference = 100 * (Largest-Smallest) / Average

There are no specific criteria for field duplicate precision, but results with an RPD of ± 25% are generally considered acceptable.

Bioassessment Sample Re-sorting

Sample re-sorting is used to quantify the sorting accuracy of the laboratory. Once samples are sorted, a second technician will re-sort the sample remnants to ensure that all organisms have been removed. The acceptable accuracy limits are shown in Table 8. Percent sorting accuracy is calculated as:

- Percent Sorting Accuracy = ((number of organisms in re-sort *100)/ number of organisms in original sort)

Bioassessment Sample Identification

Sample re-identification is used to quantify the identification and enumeration accuracy of the laboratory. Once samples are identified, a second biologist will re-identify the sample to ensure that all organisms have been accurately identified and enumerated. The acceptable accuracy limits are shown in Table 8. Percent identification and enumeration accuracy are calculated as:

- Percent Identification Accuracy = ((number of organisms misidentified)/ number of organisms in original ID)*100

- Percent Enumeration Accuracy = (number of organisms in re-identification)/number of organisms enumerated in original sample)*100

Identification discrepancies between the laboratories are discussed and resolved by the biologists. The final dataset is modified to reflect the agreed upon resolution.

Toxicity

- The survival of test organisms in laboratory control water must be at least 90% for a toxicity test to be considered valid.

- Reference toxicant results must be within ± 2 standard deviations of the average of the previous 20 tests.

- All test acceptability conditions must be within specified limits.

Bacteriology

- Reagent blank samples must be below detection (<10 MPN/100 mL) for all samples for tests to be valid.

- Positive controls must be within specified ranges for the associated tests to be valid.

Chemistry

A batch is defined as a group of 20 or fewer samples of similar matrix, processed together under the same conditions and with the same reagents. Quality control samples are associated with each batch and are used to assess the validity of the sample analyses. Control limits can be found in Table 4.1 of this document. Each batch must include the following QC checks:

- Method Blank- A method blank is a sample that contains no analyte of interest. For solid matrices, no matrix is used. The method blank serves to measure contamination associated with processing the sample within the laboratory.

- Laboratory Control Material (LCM) or Certified Reference Material (CRM)- A LCM or CRM is a sample with a matrix similar to the client samples that contains analyte of interest at known or certified concentrations. It is used to determine the accuracy of the results based on the comparison of the measured concentration with the true value. For analyte that are greater than 10 times the MDL, the acceptable percent recovery is presented in Table 4.1.

- Duplicate Analyses- Duplicate analyses are samples that have been split and processed within a single batch. They are used to determine the precision of the results based on the percent relative difference (%RSD) between the two sets of results. Control limits for %RSD are presented in Table 4.1.

- Matrix Spike/Matrix Spike Duplicates (MS/MSD)- MS/MSD are samples of similar matrix to the client's samples that are spiked with a known amount of analyte. Spike recovery measures the effect of interferences caused by the sample matrix and reflects the accuracy of the determination. The spike level should be at least ten times the MDL. The duplicate spike may be used to determine the precision of the analytical results similar to Section 10.1.3.

- Tuning Check- The tuning of the mass spectrometer is checked at the beginning of each run to insure that it is providing adequate spectra.

- Initial Calibration- Initial calibration is performed by analyzing standards of known levels of concentration. The lowest level should be less than or equal to ten times the MDL and the remaining levels should represent the entire range of expected concentrations in the samples.

- Calibration Verification- When a calibration curve is not performed for each run, a calibration verification is performed with a standard from, preferably a second source, is used to verify that the instrument is still operating within the original calibration curve.

- Internal Standard- An internal standard is a non-target analyte, which is added to samples and QC checks after the preparation of the sample, just prior to analysis. It is used to compensate for variations in the instrument response from one sample to the next.

- Recovery Surrogate- A recovery surrogate is a non-target analyte or analytes that are added to the sample prior to processing. It is used to indicate the extraction efficiency and instrument variation from sample to sample.

Table 8. (Elements 14 and 16) Quality Control

Analyte	Quality Control	Instrument Calibration
Water Column Samples		
pH	Replicate (3) measurements, check against second pH buffer, plus general maintenance and calibration practices	calibration at the start of each sample run.
Conductance	Replicate (3) measurements, plus general maintenance and calibration practices	
DO		
Temperature		
General Constituents and Nutrients in Water	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and blanks at 1 in 20 (5%) with at least one in every batch. All quality assurance and quality control procedures and criteria specified by selected method.	External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$. Calibration verification every 20 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 80% - 120%.
Organics in Water		External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$ or RSD < 10%. Calibration verification every 10 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 85% - 115%.
Metals in Water		External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$. Calibration verification every 20 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 90% - 110%
Toxicity Testing	Control organisms perform within acceptance criteria for each test.	Stock organisms tested using reference toxicants for each batch of tests. Current test must fall within ± 2 SD of last 20 combined reference toxicant tests.

Bacteria indicators	Field and sterility checks (laboratory blanks) no detectable amounts or less than 1/5 of sample amounts for field blanks. Frequency – accuracy at 1 per culture medium or reagent lot. Precision at 1 in 10 (10%) with at least one per batch. All quality assurance and quality control procedures found in *Standard Methods* (18^{th}, 19^{th}, or 20^{th} editions) section 9020 and in the selected analytical method including confirmation practices.	Follow the requirements of *Standard Methods* (18^{th}, 19^{th}, or 20^{th} editions) section 9020.
Sediment Samples		
Nutrients in Sediment	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and blanks at 1 in 20 (5%) with at least one in every batch. All quality assurance and quality control procedures and criteria specified by selected method.	External calibration with 3 – 5 standards covering the range of sample concentrations prior to sample analysis. At low end, the lowest standard at or near the MDL. Linear regression $r^2 \leq 0.995$ Calibration verification every 10 samples after initial calibration. Standard source different that that used for initial calibration. Recovery 90% - 110%
Organics in Sediment		
Metals in Sediment	Blanks – Laboratory and field blanks. No detectable amount of substance in blanks. Frequencies – Accuracy, precision, recovery, and laboratory blanks at 1 in 20 (5%) with at least one in every batch. Field blanks – initial demonstration. No further blanks collected if no detectable amount. Otherwise blanks collected at 5% of samples. All quality assurance and quality control procedures and criteria specified by selected method.	
Total organic carbon in sediment and sediment grain size	Blanks – no detectable amount or <30% of lowest sample. Frequency – Accuracy for TOC every 15 samples; Precision one per batch; LCM for TOC 1 in 20 (5%) with at least one per batch.	Follow manufacturer's requirements for TOC analyzer. Check weights for balances.

INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

15.1 Analytical Instruments

Aquatic Bioassay and CRG Labs maintain their equipment in accordance with their SOPs, which include those specified by the manufacturer and those specified by the method.

INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

All laboratory equipment is calibrated based on manufacturer recommendations and accepted laboratory protocol. Aquatic Bioassay and CRG laboratories maintain calibration practices as part of the method SOPs.

Aquatic Bioassay maintains calibration practices as part of the method SOPs and details are described in the attached documents. The Aquatic Bioassay Quality Assurance Officer has reviewed these practices and finds them to be in conformance with the SWAMP requirements.

INSPECTION/ACCEPTANCE FOR SUPPLIES AND CONSUMABLES

Glassware, sample bottles, and collection equipment will all be inspected prior to their use. Supplies will be examined for damage as they are received. The following supplies will receive additional checks as follows.

CRG Laboratories maintains a supply inspection and checking SOP, which has been examined by Aquatic Bioassay's QA officer.

Table 9. (Element 17) Inspection/acceptance testing requirements for consumables and supplies.

Project-Related Supplies / Consumables	Inspection / Testing Specifications	Acceptance Criteria	Frequency	Responsible Individual
Pre-cleaned sample bottles	Open bottle	Lids on bottles screwed on	100%	Field personnel
Lab glassware	Dirty	Clean	100%	CRG
Nisken bottle	Leakage	Works properly	Prior to survey	Aquatic Bioassay

NON-DIRECT MEASUREMENTS

The data reports for this study will cite and include monitoring data collected during previous years for this project. These data were collected in accordance with SWAMP protocols. Data collected from other studies in the area will be cited in monitoring report and used for comparative purposes. The data sets have met all QA requirements consistent with this study.

DATA MANAGEMENT

The management of bioassessment data will be initiated with the use of field and laboratory data sheets. Analysis results will be compiled in SWAMP compatible electronic formats by Aquatic Bioassay. CRG Laboratory will submit completed data sets electronically in SWAMP compatible formats to Aquatic Bioassay after QC checks have been completed. The Aquatic Bioassay Project Manager will receive and review data QC reports from the Aquatic Bioassay Data Manager who will screen all internally and externally generated for the following major items:

- A 100 percent check between electronic data provided by the laboratory and the hard copy reports
- Conformity check between the Chain-of-Custody Forms and laboratory reports
- A check for laboratory data report completeness
- A check for typographical errors on the laboratory reports
- A check for suspect values (outliers)
- A check for duplicates

The laboratories will provide data in electronic format. The required form of the SWAMP compatible electronic submittals will be provided to the laboratories to ensure the files can be imported into the project database with a minimum of editing. The data will be managed in Aquatic Bioassay's project database, which has a relational structure and is compatible for incorporation into the SWAMP database.

Following the initial screening, a more complete QA/QC review process will be performed, which will include an evaluation of analytical accuracy and precision. Accuracy will be evaluated by reviewing bioassay, chemistry and bacteriology QC results; precision will be evaluated by reviewing field duplicates, and sample completeness will be evaluated by comparing results to chain-of-custody forms.

Data will be stored on the Aquatic Bioassay network that is backed up daily in-house and off-site. Hard copies of field and lab data will be stored at Aquatic Bioassay for three years from project completion.

ASSESSMENTS AND RESPONSE ACTIONS

Scott Johnson, the Project Manager, will be responsible for the day-to-day oversight of the project. Karin Wisenbaker, the Project QA Officer will conduct periodic reviews of the data and relay any problems to the Project Manager.

If an audit discovers any discrepancy, Aquatic Bioassay's QA Officer will discuss the observed discrepancy with the appropriate person responsible for the activity (see organization chart). The discussion will begin with whether the information collected is accurate, what were the cause(s) leading to the deviation, how the deviation might impact data quality, and what corrective actions might be considered.

The QA Officer has the power to halt all sampling and analytical work by the Aquatic Bioassay or CRG Labs if the deviation(s) noted are considered detrimental to data quality.

DATA REVIEW, VERIFICATION, AND VALIDATION

Laboratory validation and verification of the data generated is the responsibility of the laboratory. The laboratory manager will maintain analytical reports in a database format as well as all QA/QC documentation for the laboratory.

Aquatic Bioassay will review all data packages received for adherence to the Data Quality Objectives set forth in this QAPP. COC forms will be reviewed to ensure adherence to collection, transport, and receipt requirements, including test initiation within the required holding time. Toxicity data will be evaluated for completeness, adherence to test methodology, passing acceptability criteria, choice of appropriate statistical methods, and proper reporting.

If results fail to meet any DQO the Project Manager and or the QA Officer will flag them for further review. Batch QA samples will be reviewed to determine the potential cause for failure to meet the DQO. If the cause cannot be readily ascertained, reserve samples will be reanalyzed (if within the designated holding times). If subsequent analyses meet the DQO, the samples will be deemed acceptable.

If samples fail to meet the DQOs a second time, or the cause of the failure cannot be identified and rectified, the data will be excluded from inclusion in the study results. All rejected data will be retained in the project database, and qualified as "rejected". The ultimate decision of whether to accept or reject a data point will be made by the Project Manager in consultation with the QA Officer.

If the analysis for more than 10% of any given analyte fails to meet the DQOs, the Project Manager and QA Officer shall meet to discuss the appropriateness of the DQO and any potential modifications. All proposed modifications of DQOs shall be reviewed by the QA Officer at the Regional Water Quality Control Board.

Laboratories will conduct a 50 percent raw data versus electronic data audit before delivering results to the final program database held by Aquatic Bioassay. If their error rate is greater than 5%, a 100% raw data audit will be triggered.

VERIFICATION AND VALIDATION METHODS

Data collected in the field will be validated and verified by the field coordinator. The laboratory maintains chain of custody and sample manifests.

Laboratory validation and verification of the data generated is the responsibility of the laboratory. The laboratory supervisor will maintain analytical reports in a database format as well as all QA/QC documentation for the laboratory.

Scott Johnson is responsible for oversight of data collection and the initial analysis of the raw data obtained from the field and the laboratory. His responsibilities also include the generation of rough drafts of monthly and final reports. Scott has final oversight on the submission of monthly and final reports.

Karin Wisenbaker will provide technical support on the analysis of raw data. Scott Johnson has final oversight on the submission of final reports.

Reconciliation and correction of any data that fails to meet the project DQOs will be done by the Project Manager in consultation with the QA Officer. Any corrections require a unanimous agreement that the correction is appropriate

RECONCILIATION WITH USER REQUIREMENTS

For data that do not meet DQOs, management has two options:

1. Retain the data for analytical purposes, but flag these data for QA deviations.
2. Do not retain the data and exclude them from all calculations and interpretations.

The choice of option is the decision of the Project Manager. If qualified data are to be used, then it must be made clear in the final report that these deviations do not alter the conclusions of the study.

Appendix A Water Quality using CTD system

Prepared by
Aquatic Bioassay and Consulting Laboratories

1.0 SCOPE

Data for various parameters throughout the water column are collected as part of the Marina del Rey Quality Monitoring Program. This method is applicable for data processing of data collected using Sea-bird Electronics (SBE) CTD sensors. **This procedure requires a working knowledge of the basics of Seabird Electronics SEASOFT software.**

2.0 BACKGROUND

Water column data are collected using a CTD (conductivity-temperature-depth) instrument during water quality monitoring surveys. These data are stored as voltages from the various sensors. Continuous water column voltage data are collected for the following parameters: 1) pressure, 2) temperature, 3) conductivity, 4) pH, 5) dissolved oxygen (DO), 6) water clarity (% Light Transmission), 7) chlorophyll-a, and 8) dissolved organic matter (CDOM). From these voltages, depth, salinity, density, and oxygen saturation are calculated. These voltages are then post-processed after data collection in batch format to produce a complete data file for each station.

3.0 DEFINITIONS

CTD - A two component system comprising a deck command unit and a submersible instrument package with modular sensors for measuring pressure, temperature, conductivity, dissolved oxygen, pH, beam light transmission, Chlorophyll-a, and dissolved organic matter (CDOM), which together allows an operator to remotely collect a profile of the water column.

Seasoft – Software provided by Seabird Electronics, which is used to collect and process water quality data using a Seabird CTD.

DATCNV – A program module from Seabird software that converts the binary data into engineering units.

ALIGNCTD – A program module from Seabird software that aligns sensors based upon response time and sensor placement.

CELLTM – A program module from Seabird software that corrects for temperature variations caused by the thermal mass of the sensors.

FILTER – A program module from Seabird software that smoothes pressure and chlorophyll data, prior to running LOOPEDIT.

LOOPEDIT – A program module from Seabird software that removes or flags bad data caused by package reversals or shed wakes. These bad data are usually caused by ship heave or variations in lowering rate.

DERIVE – A program module from Seabird software that calculates additional parameters such as depth from pressure, salinity from temperature, conductivity, and pressure, and dissolved oxygen from oxygen temperature and oxygen current.

IGODS – Interactive Graphical Ocean Data System – a software system used to display CTD data graphically.

4.0 EQUIPMENT

A laptop or personal computer with the most current version of Seasoft software is required to process CTD data.

5.0 PROCEDURE

5.1 Water Quality field data are collected using the protocol outlined in the Bight'03 field manual.

5.2 In the field, the cruise leader shall review all field data sheets for accuracy and completeness. The time of sample collection time will be recorded for each individual CTD cast. The time of the cast should be recorded at the end of the cast and should correspond to the date/time stamp of the DAT file.

5.3 For each survey, all Files with a CNV, CFG, DAT, HDR, or HEX extension will be compressed into a WINZIP file. The ZIP file name will be an eight-character name in the format YYMMDDXX.zip, where YY is the year, MM is the month, DD is the date, and XX is a two-character representation of the agency (ex. WQ is water quality). The zip file is then transferred to the computer on which the data is to be post processed.

5.4 In the directory where the data is to be processed, the following files are to be uncompressed (unzipped): All DAT and CON files

5.5 All data processing modules of the Seasoft software must be run in the correct order. For older Seabird CTD's the modules are run using Seasoft v4.249 from the MS-DOS prompt.

5.5.1. <u>DOS version – older Seabird CTD's</u>

Run Seasoft module DATCNV from the working directory, using the command "datcnv/a". This processes all of the DAT or HEX files as a batch. Run data for both down- and up-casts. These models of the Seabird CTD do not support use of the SBE43 dissolved oxygen probe; only the Beckman and YSI oxygen probes. The DATCNV variables are listed in Table 1:

Table 1. DATCNV Coefficients (DOS).

Conversion units - metric	
Column	**Variable**
0	Pressure (db)
1	Scan number
2	Temperature ITS 90 (deg C)
3	Conductivity (S/m)
4	pH
5	Oxygen Current (ΦA) *
6	Oxygen Temperature (deg C) *
7	Beam Transmission
8	Beam attenuation
9	Time, elapsed (s)
10	WET Labs fluorometer
11	WET Labs CDOM fluorometer

Parameters should be in the order listed and with the defined units. Running this executable will produce a series of CNV files.

5.5.2. Run Seasoft module ALIGNCTD from the working directory, using the command "alignctd/a". This will process all of the CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running DATCNV. Use the coefficients you normally use to process your water quality data.

5.5.3. Run Seasoft module CELLTM from the working directory, using the command "celltm/a". This will process all of the CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running ALIGNCTD. Use the coefficients you normally use to process your water quality data.

5.5.4. Run Seasoft module FILTER from the working directory, using the command "filter/a". This will process all of the

CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running CELLTM. Use the coefficients you normally use to process your water quality data.

5.5.5. Run Seasoft module LOOPEDIT from the working directory, using the command "loopedit/a". This will process all of the CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running FILTER. The LOOPEDIT variables are usually set at "minimum descent rate" with a package speed of 0.25m/sec.

5.5.6. Run Seasoft program DERIVE from the working directory, using the command "derive/a". This will processes all of the CNV files as a batch. The DERIVE input variables are listed in Table 2:

Table 2. DERIVE Input Variables (DOS).

Variable #	Variable
1	Pressure (db)
2	Scan number
3	Temperature ITS 90 (deg C)
4	Conductivity (S/m)
5	pH
6	Oxygen Current (ΦA)
7	Oxygen Temperature (deg C)
8	Beam Transmission
9	Beam attenuation
10	Time, elapsed (s)
11	WET Labs fluorometer
12	PAR sensor

The DERIVE output variables are listed in Table 3.

Table 3 DERIVE Output Variables (DOS).	
Variable #	**Variable**
1	Depth (m)
2	Oxygen (mg/L)
3	Oxygen Saturation (mg/L)
4	Salinity (psu)
5	Density (sigma-theta)
6	Descent rate (m/s)

5.5.7. The data is now completely processed and is ready to be loaded into the IGODS software program according to procedures documented in the IGODS software manual.

5.5.8. As an alternative, run the Seasoft program BINAVG from the working directory, using the command "binavg/a". This will convert all of the CNV files as a batch. BINAVG averages all of the processed data into pressure, time, or depth bins. Caution must be used when running BINAVG, because this program will exclude all data above the bottom depth of the pre-cast soak period, due to the manner in which it reads the data file. This can be avoided by manually removing the surface soak period from the data file using an MS-Dos editor.

5.6 All data processing modules of the Seasoft software must be run in the correct order. For Seabird SBE25 or 911 Plus CTD's, the modules are run in Seasoft Data Processing Win32 v5.29b. The CTD data is processed according to the steps outlined in Figure 1.

5.6.1. <u>Windows version – Seabird SBE25 or 911 Plus CTD's</u>

Run Seasoft module Data Conversion from the drop down menu. Select all of the DAT or HEX files and the CON file. This processes all of the files as a batch. Run data for both down- and up-casts. Output variables are listed in Table 4:

Table 4. Data Conversion Variables (Windows).		
Seq. #	**SBE25**	**SBE911 Plus**
1	Pressure, strain gauge (db)	Pressure, Digiquartz (db)
2	Scan Count	Scan Count
3	Temperature (ITS 90, deg C)	Temperature (ITS 90, deg C)

4	Conductivity (S/m)	Conductivity (S/m)
5	pH	pH
6	Oxygen Voltage, SBE43	Oxygen Voltage, SBE43
7	Beam Transmission, Wetlab Cstar (%)	Beam Transmission, Wetlab Cstar (%)
8	Beam Attenuation, Wetlab Cstar (1/m)	Beam Attenuation, Wetlab Cstar (1/m)
9	Time, elapsed (s)	Time, elapsed (s)
10	Fluorescence, Wetlabs Wetstar (mg/m^3)	Fluorescence, Wetlabs Wetstar (mg/m^3)
11	CDOM Fluorescence, Wetlabs (mg/m^3)	CDOM Fluorescence, Wetlabs (mg/m^3)

Parameters should be in the order listed and with the defined units. Running this executable will produce a series of CNV files.

5.6.2. Run Seasoft module Align CTD from the drop-down menu. This will process all of the CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running DATCNV. Use the coefficients you normally use to process your water quality data.

5.6.3. Run Seasoft module Cell Thermal Mass from the drop-down menu. This will process all of the CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running Align CTD. Use the coefficients you normally use to process your water quality data.

5.6.4. Run Seasoft module Filter from the drop down menu. This will process all of the CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running Cell Thermal Mass. Use the coefficients you normally use to process your water quality data.

5.6.5. Run Seasoft module Loop Edit from the drop-down menu. This will process all of the CNV files as a batch. Running this executable will produce a series of CNV files that overwrite the set of CNV files produced from running Filter. Use a "minimum package descent rate" of 0.25 m/sec.

5.6.6. Run Seasoft program Derive from the drop-down menu. This will processes all of the CNV files as a batch. The DERIVE input variables are listed in Table 5:

Table 5. Derive Input Variables (Windows).		
Seq. #	CTD – SBE25 Ser. # 2517321-0226	CTD – SBE911 Plus Ser. # 09P82886-0684
1	Pressure, strain gauge (db)	Pressure, Digiquartz (db)
2	Scan Count	Scan Count
3	Temperature (ITS 90, deg C)	Temperature (ITS 90, deg C)
4	Conductivity (S/m)	Conductivity (S/m)
5	pH	pH
6	Oxygen Voltage, SBE43	Oxygen Voltage, SBE43
7	Beam Transmission, Wetlab Cstar (%)	Beam Transmission, Wetlab Cstar (%)
8	Beam Attenuation, Wetlab Cstar (1/m)	Beam Attenuation, Wetlab Cstar (1/m)
9	Time, elapsed (s)	Time, elapsed (s)
10	Fluorescence, Wetlabs Wetstar (mg/m^3)	Fluorescence, Wetlabs Wetstar (mg/m^3)
11	CDOM Fluorescence, Wetlabs (mg/m^3)	CDOM Fluorescence, Wetlabs (mg/m^3)

The DERIVE output variables are listed in Table 6:

Table 6. Derive Output Variables (Windows).		
Seq. #	CTD – SBE25 Ser. # 2517321-0226	CTD – SBE911 Plus Ser. # 09P82886-0684
1	Depth (m)	Depth (m)
2	Oxygen (mg/L)	SBE43 Oxygen (mg/L)
3	Oxygen Saturation (mg/L)	SBE43 Oxygen Saturation (mg/L)
4	Salinity (psu)	Salinity (psu)
5	Density (sigma-theta)	Density (sigma-theta)
6	Descent rate (m/s)	Descent rate (m/s)

5.6.7. The data is now completely processed and is ready to be loaded into the IGODS software program according to procedures documented in the IGODS software manual.

5.6.8. As an alternative, run the Seasoft module Bin Average. This will convert all of the CNV files as a batch. Bin Average averages all of the processed data into pressure, time, or depth bins. Caution must be used when running Bin Average, because this program will exclude all data above

the bottom depth of the pre-cast soak period, due to the manner in which it reads the data file. This can be avoided by manually removing the surface soak period from the data file using an MS-Dos editor.

6.0 PERSONNEL

Personnel from each participating agency trained in the use of Seabird software are responsible for processing CTD data that is collected for the OCSD ocean-monitoring program.

7.0 LITERATURE CITED

- Seabird Electronics, CTD Data Acquisition Software, Seasoft DOS Version 4.249, May 2001.
- Seabird Electronics, CTD Data Acquisition Software, Seasoft Windows Win32 Version 5.29b, September 2003.
- Seabird Electronics Training Class Handout, CTD Data Processing, 1999.
- Seabird SBE Data Processing Manual v5.28a.pdf

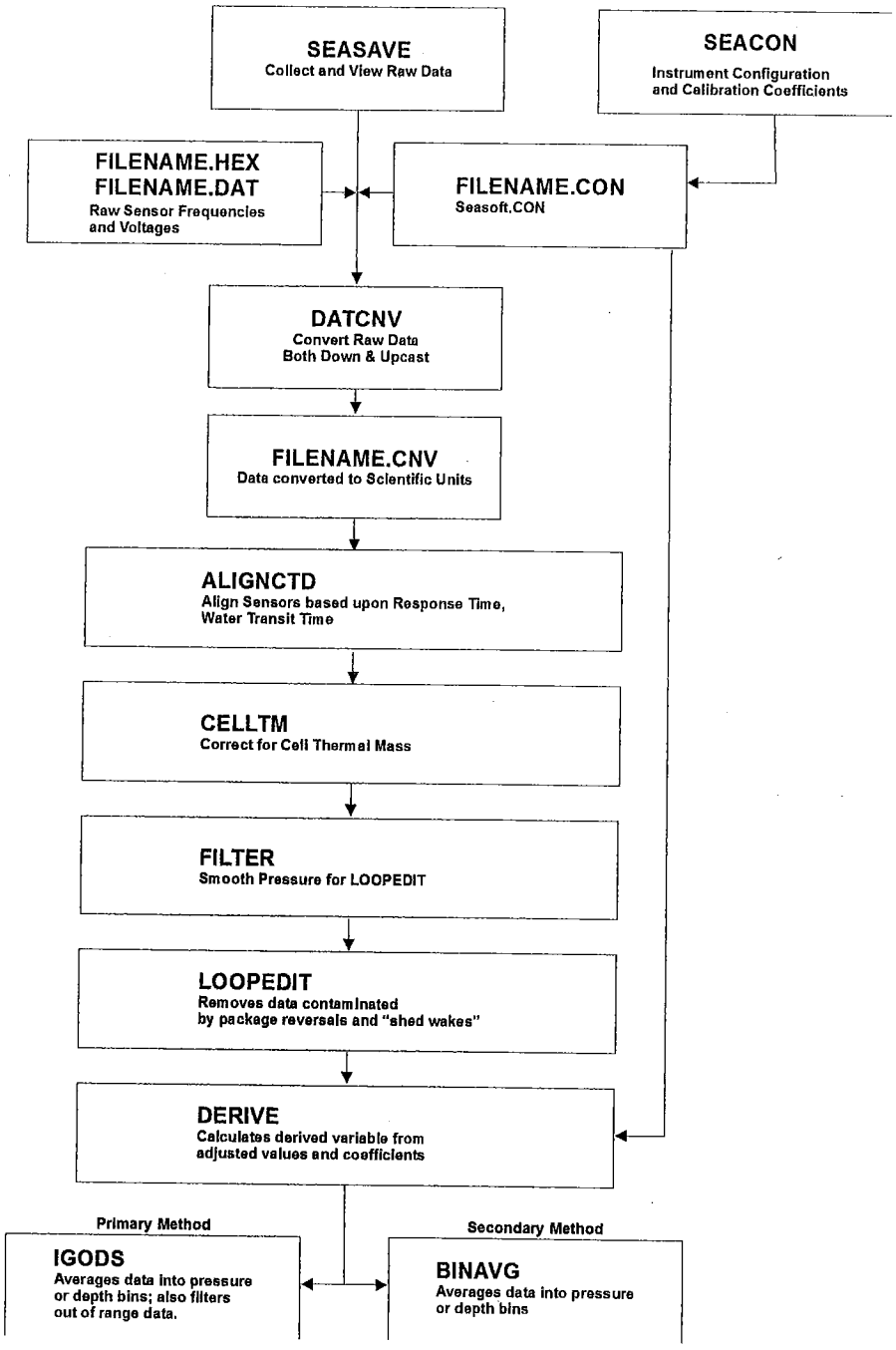


Figure 1. Data Processing Diagram

Appendix B. Benthic Sediment Sampling

Benthic Sampling

VAN VEEN GRAB

A 0.1 m^2 modified Van Veen grab will be used to collect sediment samples for physical, chemical, and infaunal analyses (Stubbs et al. 1987). This device is manufactured by Kahl Scientific Instrument Corporation, PO Box 1166, El Cajon, California 92022-1166 (619/444-2158) kahl@kahlsico.com. The grab may be galvanized, stainless steel, or Teflon-coated. All surfaces of the grab must be clean and free of rust. Either single or tandem Van Veen grabs are acceptable.

GRAB SAMPLING PROCEDURES

Prior to deployment, the grab is cocked with the safety key in place. The grab is then hoisted over the side, the safety key is removed. The grab is lowered at up to 2 m/sec until it is approximately 5 m above the bottom, then lowered at 1 m/sec to minimize the effects of bow wave disturbance of the surface sediment. In water depths greater than 300 m, the rate of deployment may have to be reduced to <1 m/sec in order to avoid "kiting" of the grab and/or premature tripping in the water column. After bottom contact has been made (indicated by slack in the winch wire), the tension on the wire is slowly increased, causing the lever arms to close the grab. Once the grab is back on board, the top doors are opened for inspection.

While a radius limit of 100 m (200 m for island stratum) has been established for site occupancy, once sampling has begun, the Cruise Leader will ensure that the vessel is maintained on station with as much precision as conditions allow. Because analytical results from separate grab samples will be used to characterize the benthic community biointegrity, contaminant load and, in many cases, toxicity of the sediment, each successive grab must be collected as close as possible to the others.

PRIORITY OF GRAB SAMPLING

The priority of sampling at a site is 1) infauna, 2) sediment chemistry and grain size, and 3) sediment toxicity. If it is impossible to obtain all three sample types at a station, those samples successfully collected shall be processed and retained. Only those samples meeting the sample acceptance criteria and sample volume requirements (for sediment chemistry and toxicity) are considered to be successfully sampled.

CRITERIA FOR ACCEPTABLE GRAB SAMPLES

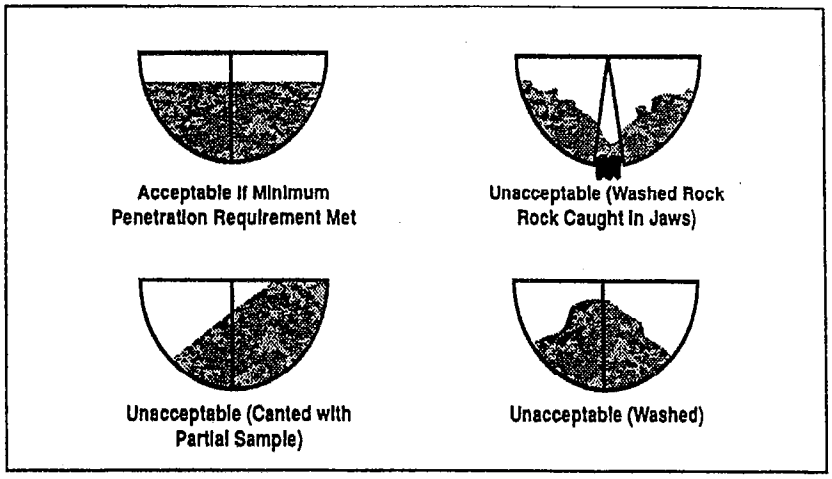
Site acceptance criteria and procedures are described in Section 7. Both site and sample acceptance criteria are summarized as a decision tree in Figure 1.

Once a site has been successfully occupied grab sampling may still prove impossible or very difficult. Different sediment types (e.g. cobble, gravel, well-sorted sands, etc.) and localities (e.g. canyons, slopes, and rocky areas) may be difficult to sample. Sediments containing rocks often create the most common problem by preventing complete closure of the grab and allowing sediment to wash out during retrieval. The randomized sampling design may cause some of the Bight'03 sampling sites to occur on these difficult sediment types or localities. Therefore, if after three consecutive unsuccessful grab attempts at a site and up to three more consecutive unsuccessful attempts a second location (within the radius limit and +/- 10% of the depth of the target site or 1 m in estuaries), the station should be abandoned.

If sampling success is intermittent, the site may be abandoned after a minimum of nine (9) attempts. In this case, only the successfully (complete) collected sample types should be processed and retained. These are the minimum efforts justifying site abandonment. Sampling failures due to operational error (e.g., premature tripping) do not count towards this minimal effort. The Cruise Leader has the discretion to make a greater effort if he/she feels that it is warranted. The reason for site abandonment must be documented in the field computer or on the field data sheets.

Upon retrieval of the grab, the acceptability of the sample must be determined. Acceptability is based upon two characteristics of the sample: sample conditionand depth of penetration. Sample condition is judged using criteria for surface disturbance, leakage, decanting, and washing (Figure 3).

FIGURE 3. Examples of acceptable and unacceptable grab sample condition (from Tetra Tech 1986).



An acceptable sample condition is characterized by an even surface with minimal disturbance and little or no leakage of the overlying water. Heavily canted samples are unacceptable. Samples with a large amount of "humping" along the midline of the grab, which indicates washing of the sample during retrieval, are also unacceptable. While some humping will be evident in samples taken from firm sediment where penetration has been poor, this is can be due to the closing action of the grab and is not necessarily evidence of unacceptable washing.

If the sample condition is acceptable, the overlying water is drained off and the depth of penetration determined by insertion of a plastic (rather than metal) ruler vertically along the grab midline and measuring to the nearest 0.5 cm. Sediment penetration depth must be at least 5 cm: however, penetration depths of 7-10+ cm should be obtained in silt (fine sand to clay). In habitats where sediments are unusually soft (*e.g.*, some estuary muds), it may be necessary to remove the lead weights to prevent over-topping the grab. Extra caution should be taken to drain the overlying water from the grabs for chemistry and toxicity samples. It is recommended that a siphon be employed for these grabs to avoid disturbance and loss of the surface sediments. The overlying water in grabs intended for infaunal samples may be drained by slightly opening the jaws of the grab and allowing the water to run off, as long as all drained water is captured for screening with the sediments (see Sample Processing below).

If both sample condition and penetration are acceptable in the first grab, sampling at the station will proceed with the collection of chemistry and then sediment toxicity samples from successive grabs. **It is required that all of the grabs taken at a station be of similar sediment type and depth penetration.**

BENTHIC SAMPLING EVENT DATA

The Cruise Leader is responsible for collecting all of the required information associated with each station occupation and each grab sampling event. A software application has been developed to facilitate the capture and entry of these data (Section 6). Alternatively, paper data forms may be used (Appendix 6). The required station occupation information includes:

- Station ID
- Date
- Time of day
- Agency code
- Vessel name
- System used for Navigation
- Weather and sea conditions
- Salinity (at sites in the Estuary stratum)
- Station fail code (if site is abandoned)

- ☐ Time of day for event (when grab on bottom)
- ☐ Latitude and Longitude at time of event (when grab on bottom)
- ☐ Depth of water (when grab on bottom)
- ☐ Distance from station target location (when grab on bottom)
- ☐ Fail code (if sample fails to meet sample acceptance criteria, see Field Sheets or Information Management Plan for codes)
- ☐ Penetration
- ☐ Sediment composition (type)
- ☐ Sediment odor
- ☐ Sediment color
- ☐ Presence of shell hash
- ☐ Sample types produced from sediment grab

SEDIMENT DESCRIPTION

The field description of sediments is required following measurement of penetration depth. The sediment should be characterized as being coarse sand, fine sand, silt or clay, gravel, or of a mixed type. The presence of petroleum tar and shell hash should also be recorded. Obvious odors, such as hydrogen sulfide (the odor of rotten eggs), petroleum, other odors, or a lack of noticeable odors should be recorded. General sediment colors (i.e., black, green, brown, red, olive, or gray) should also be recorded.

SAMPLE PROCESSING

Benthic Infaunal Samples

After the sample description has been completed, the sediment sample intended for biological analysis is washed from the grab and screened. Raw water used to wash the samples is to be filtered in some fashion to prevent the accidental introduction of surface-water organisms. Thoroughly wash the sediment from the grab and transfer it to a sediment-washing table for screening.

In the estuary stratum, the necessity of sampling from small craft may not permit onboard screening of the sediment. In these cases the samples may be screened and processed on land at a screening station temporarily established near the sampling location. To assure that the sample does not deteriorate, such "off-site" screening must be completed as soon as possible and no longer than 90 minutes after sample collection.

A means of capturing all water drained from the grab, the grab sample, and the wash water must be used. Typically, a tub ($\geq$70 L capacity) is positioned under the grab. The use of a sediment-washing table is recommended, but not required. The table is useful in that provides a flat, smooth surface over which to spread and wash the sample, thereby providing a means of gently breaking up the sediment before it runs off the end of the table into the screen box. The screening box must be equipped with a stainless steel mesh with 1.0-mm openings. Wire diameter should be similar to that found in the

U.S. Standard 1.00 mm Sieve (i.e., 0.58 mm). The surface area of the screen should be adequate to easily accept the sample without build up..

Once the sample has been washed through the screen, transfer the material (debris, coarse sediment, and organisms) retained on the screen to a sample container. Label the sample container with an external label containing the station name, sample type, date, and "split number" (i.e. 1 of 1, 2 of 3, etc.) if required. An internal label bearing the same information is placed inside the infaunal samples. This label can be written in pencil or indelible ink on 100% rag paper, poly-paper, or other paper of a quality suitable for wet labels. The sample container must have a screw-cap closure and be sufficiently large to accommodate the sample material with a head-space of at least 30% of the container volume. A sample may be split between two or more containers. However, each container must have external and internal labels (as described above) with the appropriate "split number" clearly marked. Field crews should have a broad range of sample container sizes available to them, with none less than 16 oz (0.47 L) capacity.

Gently remove the material retained on the screen, taking care to avoid damaging the organisms. The sample container should be filled to approximately 50 to 70% of capacity with screened material. After the bulk of material has been transferred to the container, closely examine the screen for any organisms caught in the mesh. Remove any organisms with forceps and add them to the sample container. Thoroughly wash the screen box and scrub the mesh before the next sample is screened.

All infaunal samples will be treated with a relaxant solution for approximately 30 minutes prior to fixation. Either an Epsom salts ($MgSO_4$) solution or a propylene phenoxytol solution (formulations below) may be used for this purpose. Relaxant solutions may be used as the diluent water for the fixative, or may be decanted after exposure and replaced with diluted fixative. If it is used as diluent water, fill the sample container to 85 to 90% of its volume, close the container and invert it several times to distribute the solution. Leave the sample in the relaxant for 30 minutes. After 30 minutes, top off the container with enough sodium borate buffered formaldehyde to achieve a 10% formalin solution. Close the container, once again, and invert it several times to assure mixing. Store the sample for return to the laboratory.

If the relaxant solution is not used as the diluent water, the relaxant must be removed from the sample container and replaced with 10% buffered formalin. After the 30 minutes of treatment, decant the relaxant from the sample through a screen with a mesh size of 1.0 mm or less. Insure that all animals are removed from the screen and placed in the sample container. Fill the container with sodium borate buffered 10% formalin rather than undiluted formaldehyde, then close the container, invert it several times and store it for return to the laboratory.

Relaxant and fixative stock solution alternatives are as follows:

1) Epsom salts relaxant solution: 1.5 kg Epsom salts ($MgSO_4$ @ $7H_2O$) per 20 L of freshwater.

2) Propylene phenoxytol solution: 30 ml propylene phenoxytol to 20 L of seawater.

3) Buffered formalin solution: 50 g sodium borate ($Na_2B_4O_7$) per liter of formalin.

4) Buffered 10% formalin solution: 1 part buffered formalin to 9 parts fresh or salt water.

Sediment Chemistry Samples

Following collection of benthic infauna, the next grab(s) will be taken for sediment chemistry samples. More than one grab may be necessary to meet the sample volume requirements of this sample type. If a second grab is necessary, the sediment from each grab will be distributed evenly among the individual sample containers. Sediment samples will be collected by randomly sub-sampling the top 2 cm of the undisturbed surface material with a stainless steel scoop (a plastic scoop is acceptable for TOC and grain size samples). At the very minimum, scoops will be washed with soap and water and rinsed with de-ionized (DI) water between stations. Use of a new scoop with each sample is also acceptable. Sediment in contact with or within 1 cm of the metal sides of the grab will be avoided to prevent sample contamination.

The target volume for the sediment chemistry samples is 100 grams for grain size and 200 grams for the other three analytes. The goal is to collect enough sediment at each site to satisfy the target volumes for these samples. If conditions are particularly difficult at any sampling site and nine grabs have been attempted with only intermittent success, the minimum acceptable volume for the sediment chemistry samples is 100 grams. If less than 100 grams has been collected for any of the analytes, the samples will be discarded and the reasons for incomplete sampling at the site will be recorded.

The following container types, samples sizes, and storage requirements will be used with the analytical laboratory supplying all sample containers for all parameters:

1) **Sediment Grain Size** – Using a stainless steel or plastic scoop, approximately 100 g of sediment material will be collected at each station. The sample shall be placed in a 4-oz (118 mL) whirlpak, plastic, or glass container, taking care to leave an air space at the top. Samples should be stored at approximately 4 $^{\circ}$C by placing them on wet ice or in a refrigerator until returned to the laboratory. **Do not freeze these samples.** They should be returned to the analytical laboratory within a week of sampling.

2) **Total Organic Carbon** -- Using a stainless steel scoop, approximately 200 g of sediment material will be collected at each station. The sample

Appendix C. Fish Trawl Sampling

Trawl Sampling

COLLECTION PERMITS

Prior to collecting fish and invertebrate specimens in the field, each organization must contact their local office of the California Department of Fish and Game (CDFG). The caller will be asked for his or her name, scientific collector's permit number, date, time, and area of sampling, type of gear to be used, vessel size, color, CF number (or documentation), number of persons in party, and organisms targeted for collection. This information can also be faxed to the local CDFG office prior to sampling. Both the permit and the permit holder must be onboard during sampling and it must be presented to any CDFG warden, or personnel who request to see it. The phone//FAX numbers of the local offices of the CDFG are as follows: San Diego, (858) 467-4201/(858) 4674299; Los Alamitos, (562) 342-7108/(562) 342-7139.

OTTER-TRAWL SPECIFICATION

A semiballoon otter trawl (Figure 4) will be used to collect epibenthic invertebrates and demersal fish. Net dimensions are as follows: 7.6-m headrope (25 ft); 8.8-m footrope (29 ft); 3.8-cm (1.5 in) body mesh; and a 1.3 -cm cod-end mesh (0.5 in). This net will have 22.9-m (75 ft) long bridles made of 1.0-1.6 cm (3/8 to 5/8 in) diameter rope (e.g., Samson braid). Typical otter boards (doors) will have a width of 76 cm (30 in), height of 50 cm (20 in), and a suggested weight of 16 kg (35 lb) (Figure 5). Slight deviations (< 10%) from the dimensions are acceptable. The door chains should be 5-mm (3/16 in) in diameter and should have the following numbers of links: front top -- 12; front bottom -11; back top -- 17; back bottom -- 16. The actual specifications of how any trawl door is set up may depend on the manufacturer of the otter trawl, but the user of the equipment should be sure to follow the factory recommended set-up procedures to ensure that the

net fishes appropriately in the field.

FIGURE 4. Semi-balloon otter trawl recommended for marine receiving-water monitoring programs in southern California (modified from Mearns and Allen, 1978)

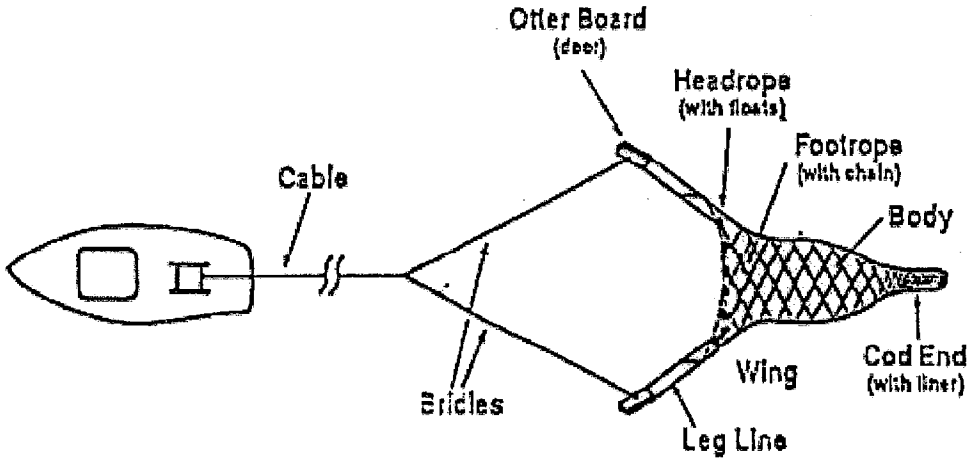
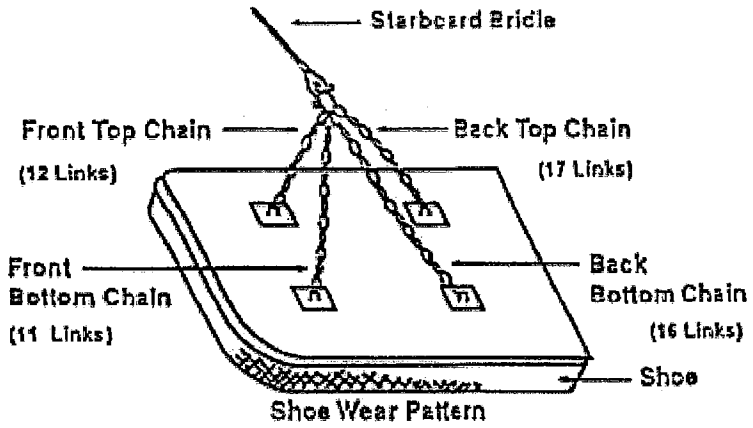


FIGURE 5. View of an otter board of a semiballoon otter trawl with recommended numbers of chain (5-mm or 3/16 in. diameter) links (modified from Mearns and Allen, 1978)



TRAWL DATA FLOW AND RESPONSIBILITIES

TRAWL SAMPLNG EVENT DATA

The Cruise Leader is responsible for collecting all of the required information associated with each station occupation and each trawl sampling event. A software application has been developed to facilitate the capture and entry of these data (Section 6). Alternatively, paper data forms may be used (Appendix 6). The required station occupation information includes:

- Station ID
- Date
- Time of day
- Agency code
- Vessel name
- System used for Navigation
- Weather and sea conditions
-

The required trawl event information includes:

- Trawl event progress description (net over, start trawl, end trawl, on deck)
- Latitude and Longitude at time of trawl event progress ()
- Depth of water during trawl event progress
-

NET PREPARATION

The trawl components should be properly prepared prior to trawling so that the trawl can be deployed in an orderly and safe manner upon arrival at a station. The net should be laid out and stacked on the stern of the vessel in the same configuration that it will be deployed: cod-end to the stern, floats up, and foot rope down. The trawl net should be checked to make sure that the cod-end is tied correctly, the doors should be connected properly to the leg lines, and the bridles should be securely fastened to the doors and to the tow wire.

STATION OCCUPATION

Every effort should be taken to ensure that any particular trawl track passes the station coordinates at a distance of no greater than 100 m (200 m for Island stratum), and that the trawl course varies no more than +/- 10% of the target depth (Figure 2). The trawl track can be plotted prior to sampling so that a successive series of waypoint locations along the track can be obtained. These coordinates can then be entered into the DGPS and then retrieved at the time of sampling to ensure that the vessel maintains its course along the trawl track.

PRE-TRAWL SURVEY

Prior to trawling at a new station, it is important to conduct a pre-trawl survey of the trawl course. Trawl gear is likely to be lost if it becomes snagged on bottom obstructions and replacement of nets can be costly. The trawl course at a previously unsampled station should be evaluated by use of a fathometer. This pre-trawl survey can enable the navigator to avoid uncharted reefs and other obstacles. If obstacles are encountered, resurvey a new trawl course. The Cruise Leader alone has the authority to decide whether to trawl or abandon an unknown station. This survey should always be conducted at a new sampling site to determine whether the station is acceptable or if it should be abandoned. The pre-trawl survey should follow the expected trawl course along the isobath and the fathometer will be examined for evidence rocks and other obstacles.

If the first run indicates that a particular site is unacceptable, another survey will be conducted within 100 m or the original location and within +/-10% of the original depth. If this attempt is unsuccessful, a third attempt will be conducted at a different location using the same protocols (100 m of the original location, and +/-10% of original depth). The site will be abandoned after three unsuccessful attempts (Figure 2).

TRAWLING

Trawls will be towed along, rather than across, isobaths. While the vessel is underway the net and doors are placed in the water. It is important that the floats skim the surface and that the net is not entangled (e.g., crossed leg lines, bunched or hooked portions of the net) prior to paying out the bridles. This small step could mean the difference between a successful or unsuccessful trawl. The bridles should be paid out by

personnel on either side of the net, so as to avoid becoming entangled in the rigging during deployment.

Use of the proper scope (i.e., length of hydrowire paid out versus the water depth) is important for successful trawls. After the net touches the bottom, a sufficient length of hydrowire (towing wire) should be paid out to ensure that the net is pulled from a horizontal rather than a vertical position. Insufficient scope will prevent the net from consistently fishing the bottom and will result in a no-catch, or a short-catch situation. In general, the required scope declines with increasing depth because the additional weight of the hydrowire enhances the horizontal component of the towing forces (Table 2).

TABLE 2. Recommended scope and length of wire for trawling at different depths in the Southern California Bight.

Water Depth (m)	Tow Wire Out (m)[1]	Approximate Scope (m)
<5	50	10.0:1
10	80	8.0:1
30	180	6.0:1
60	300	5.0:1
100	400	4.0:1
150	550	3.6:1
175	625	3.5:1
200	700	3.5:1
500	1,100	2.2:1

[1] Note that 25 m of bridle is included in this scope.

These scopes are for 1.0 cm (0.38 in) hydrowire. These scopes will have to be adjusted accordingly when using a different diameter of hydrowire. Once on the bottom, the net is towed for 10 minutes at 1.0 m/sec (or 1.5 to 2.0 kn). Under normal circumstances, this distance over ground is equivalent to 450-600 m. Trawl speed and distance can be determined by DGPS. In confined areas (e.g. bays and harbors) the trawl duration may be reduced to 5 min, or a distance over ground of 225-300 m. Trawl speed and duration will be recorded on the Trawl Data Sheet (Appendix 6).

At the end of the prescribed trawl time, the net is retrieved and brought onboard the vessel. The cod-end is then opened and the catch deposited into a tub or holding tank. The catch is subsequently released to the scientific crew for processing.

CRITERIA FOR ACCEPTING A TRAWL

If the trawl is retrieved with little or no catch in the cod-end, its acceptability will be evaluated according to whether the trawl was conducted properly. The criteria used to evaluate the success of any trawl include making sure that proper depth, scope, speed, and distance (or duration) were maintained, whether the net was fouled (net tangled), and whether the catch shows evidence that it was on the bottom (e.g., rocks, benthic invertebrates, benthic fish) (Figure 2). If any of trawl procedures were not followed, if the net was fouled or torn (the tear must be sufficient to allow escapement), or if there was no evidence of contact with the bottom (downloading the Lotek information can be useful), the trawl will be considered unacceptable and the site will be retrawled. When evaluating the situation to decide whether to abandon or retrawl a station, the Cruise Leader should keep in mind that the goal is to collect the best sample possible.

If a retrieved net has been torn sufficiently to allow escapement during the course of a trawl, the station will be abandoned. If the trawl hangs up on the bottom, the site can be resampled or abandoned at the discretion of the Cruise Leader. If retrawling that station proves unsuccessful after another two attempts, the site will be abandoned (Figure 2).

SAMPLE PROCESSING

Sorting

The trawl catch will be sorted on deck into containers. The catch should initially be rough sorted into major categories (e.g., urchins, shrimp, other invertebrates, flatfishes, rockfishes, other fishes). The categories used are not important, but it is more efficient to sort into rough categories before identifying organisms to species. Trawl debris should also be sorted into containers for processing.

Trawl Debris

Debris collected during any trawl should be quantified by recording the specific types of material and their quantities on the Trawl Debris Data Sheet (Appendix 6). Trawl debris volumes are quantified using the following categories: present (1); low (2-10); moderate (11-100); and high (>100). The approximate weight of each type should also be estimated using these categories: trace (<0.1 kg); low (approx. 0.1-1.0 kg); moderate (approx. 1.1-10.0 kg); and high (>10.0 kg).

Identification

The goal is to provide species-level identifications for all fish and invertebrates captured in the trawl. Most, if not all, of the trawl-caught organisms should be identifiable to species in the field using the recommended taxonomic keys and field guides. Species of fish and invertebrates that cannot be reliably identified to species in the field should be returned to the laboratory for further identification. In these instances, it is better that the field crew recognize their taxonomic limitations, record "FID" (further identification) on the field sheet and include descriptions of any attributes that may later aid in the

identification of that specimen. Under no circumstances should an organism be discarded if the identity is in question.

When the "FID" organisms have finally been identified, the correct identity of the species should be recorded on the original data sheet. If the laboratory identity differs from that recorded in the field, the original name should be crossed out with a single line only; do not erase the original name. If a specimen cannot be identified by the sampling organization, it will be sent to SCCWRP for further analysis.

Although all fish collected during Bight'03 will be identified to the lowest possible taxon (either in the field or in the laboratory), only certain trawl-caught invertebrates meeting very specific criteria will need to be identified to that level. There are likely to be many small infaunal and pelagic species that will be taken incidental to the trawl catch. These need not be processed or documented. Only epibenthic invertebrate organisms greater than 1 cm in any dimension will be included in the data. Colonial and pelagic organisms will be noted, but do not need to be enumerated. The presence of obvious fish parasites, such as leeches or cymothoid isopods, should be noted.

Either common or scientific names of fish may be used in the field, however, in the case of invertebrates, only scientific names are permissible. Use standard common and scientific names of fishes and scientific names of invertebrates given in a list of trawl-caught species of fishes and invertebrates in southern California that have been distributed to organizations prior to the survey. For species not in these lists, use only standard common and scientific names of fishes given in Robins et al. (1991), or scientific names of fishes from Eschmeyer (1998), and common names of invertebrates from SCAMIT (2001).

Each organization should have a kit containing a variety of tools which will aid in field identification. The kit should include forceps (small with sharp points and large with blunt points), a hand lens, dividers or calipers, dissecting needles, scalpels with scalpel blades, probes, and plastic rulers (marked in millimeters).

Examination for Gross Pathology

During the identification and measurement procedures, fish and invertebrates will be

examined for gross pathology. This entails a scan of an individual organism for anomalies and noting the type of pathology (by abbreviation) next to the length of organisms (for fish) during measurement on the appropriate data sheet. The following anomalies will be noted for fish:

1) fin erosion 2) tail erosion 3) tumors 4) external parasites (e.g., copepods, isopods, leeches) 5) eye parasites (i.e. *Phrixocephalus)* 6) color anomalies (ambicoloration, albinism) (Mearns and Haaker 1973) 7) skeletal deformities (Valentine 1975) 8) lesions 9) other anomalies

An observation should be noted next to the individual length on the Fish Species Data Sheet and described in the comments section.

For invertebrates, burnspots, parasites, and other anomalies will be noted in the comment section of the Trawl Invertebrate Species Sheet.

Fin erosion can be found on the dorsal, anal, and caudal fins of flatfishes, and on the lower caudal fin and pelvic fins of bilaterally symmetrical fishes. Tail erosion occurs on the top and bottom of the caudal fin or along the entire posterior caudal fin of bilaterally symmetrical fishes. Tumors can be smooth and rounded (angioepithelial nodules) or furrowed (epidermal papillomas). Externally obvious copepod parasites occur on the eye, fins, or body of fish. Cymothoid isopods occur in the gill cavities of fish or on the body; they often fall off. Leeches occur on the body of some flatfishes. Skeletal deformities include crooked backs, snub noses, or bent fin rays. Lesions include sores that do not appear to be caused by net damage. Burnspot disease is found on crabs and some shrimps; its lesions resemble cigarette burns. Parasites of invertebrates include bopyrid isopod parasites of shrimp.

Representatives of fish and invertebrates exhibiting each new instance of disease or which have a different parasite should be returned to the laboratory and vouchered.

Safe Handling of Organisms

Field personnel are likely to encounter a variety of organisms that are potentially harmful. California scorpionfish (*Scorpaena guttata*) have venomous fin spines that can cause severe pain. This species should be handled with leather gloves and/or pliers. Hot water, meat tenderizer or ammonia should be applied to any puncture wound inflicted by this fish; heat is useful in breaking down the protein in the venom.

Several species of rockfishes and the spotted ratfish (*Hydrolagus colliei*) also have mildly venomous spines which can cause a burning sensation. The round sting ray (*Urobatis halleri*), the California butterfly ray (*Gymnura marmorata*), and the bat ray (*Myliobatis californica*) all have venomous spines on their tails.

The Pacific electric ray (*Torpedo californica*) can emit a very strong electric shock. If you must handle this species, wear rubber gloves and hold it by the tail. **Do not grasp the disk with both hands!**

Pacific angel sharks (*Squatina californica*), spiny dogfish (*Squalus acanthias*), spotted ratfish, Pacific electric rays, and California halibut (*Paralichthys californicus*) all have sharp teeth that can result in painful bites if they are not handled properly.

Care must also be taken in handling the blueleg mantis shrimp (*Hemisquilla ensigera*). This species is capable of severely cutting a person with its raptorial appendages. Care should also be taken in handling any of the large crabs and octopus.

Preservation of Specimens

Incompletely identified fish and invertebrate specimens, and those with diseases that require further examination should be returned to the laboratory. Fish and invertebrate specimens may be preserved or documented for QC or identification purposes in one of three ways:

1) fixing in buffered formalin-seawater;
2) freezing; 3) photographing.

However, all such specimens should be fixed in buffered formalin-seawater unless they are absolutely too large for preservation in this manner in the field.

The preferred method for preserving small specimens is to fix them in 10% buffered formalin-seawater. Specimens with fin erosion, tumors, or lesions will be fixed in this manner. Buffered formalin is made by mixing 50 g $Na_2B_4O_7$ (sodium borate) per liter of formaldehyde or 5 g per liter of 10% formalin. The body cavities of fish greater than 60 mm in length should be slit with a scalpel on the right (for most bilaterally symmetrical fish), the blind side (for flatfish), or ventral side (for dorsoventrally flattened fish, such as

rays) before the specimen is placed in formalin. The slit allows preservative to enter the body cavity and preserve the internal organs. **Note that by convention, bilaterally symmetrical fish are photographed or drawn with their heads facing left and dissections or gut cavity incisions are conducted only on the right side of the fish.**

Fish and invertebrates will be placed in plastic bags or plastic jars and fixed in 10% buffered formalin-seawater. Fish should be inserted tail-first into jars so that they can be removed easily without destroying the fin rays or spines.

Fish should remain in formalin for no more than a week before being transferred to a freshwater bath. It is recommended that fish specimens soak in the water for at least two days. The water should be changed at least once during that period. The fish should then be transferred to a solution of 50% isopropanol (isopropyl alcohol), or 70% ethanol for preservation.

Trawl-caught invertebrates will also be fixed in 10% buffered formalin-seawater and preserved in 70% ethanol. Voucher specimens should not be submitted to SCCWRP until they have been transferred to alcohol.

Larger specimens can be placed in plastic bags and frozen on dry ice if excessively large quantities of formalin would be required to fix the specimen in the field. These can then be thawed and fixed in the laboratory with a 10% buffered formalin solution. If possible, large specimens with tumors, fin erosion, or lesions should be fixed in the field with formalin rather than frozen. **Do not freeze specimens that can otherwise be preserved in the field in formalin-seawater.**
Small invertebrates (e.g., nudibranchs) may be kept cold in seawater and returned alive to the lab for identification.

Only large specimens of fish and invertebrates can be vouchered in the field by photographing them in color. If a photograph is used for a voucher of a species, it should show the overall appearance of the specimen, and all important identifying features. If characters necessary for the identification of a species cannot be seen in the photograph, the photograph will not be accepted as a voucher. Colorful fishes may also be photographed in addition to providing a preserved specimen to aid in identification of the voucher. Photographs of unidentified rockfishes, in particular, should be taken as soon as possible after capture because their color, which is an important taxonomic character, fades during preservation. Bilaterally symmetrical fish and dorsoventrally flattened fish (skates, rays) should be photographed facing left. Flatfish should be photographed with the eyed side up. The left-eyed species should be photographed facing to the left and the right-eyed species should face to the right (**Note:** The gill cover should cut the **lower** profile of the body). If an anomaly or important character occurs on the opposite side of the recommended profile for a particular type of fish, a photo should <u>also</u> be taken of the afflicted side. All specimens should be photographed on a light background with a meter stick along side and a label giving date, station number, and species in large bold letters. Notes should be made of character states that can aid

in identification (e.g., counts of fin rays, gill rakers, and scales).

Specimens preserved for further identification must be noted on the field data sheet. Note whether the organism is fixed, frozen, or photographed. A photograph log should be kept during the survey, documenting species name, the frame number, the date and the station location of each photograph.

Appendix D. Benthic Infauna Laboratory Procedures

Benthic Laboratory Manual

Aquatic Bioassay and Consulting Laboratories

INTRODUCTION

This document describes laboratory procedures to be followed in the analysis of macrobenthic (infaunal) samples collected for The County of Los Angeles Department of Beaches and Harbors. It is the responsibility of the laboratory's supervisor to assure:

- That the detailed procedures described in this manual are followed during sample processing and analysis,
- All Quality Control (QC) steps are implemented,
- Data submissions conform to the stipulated data standards,
- Schedules are met for sample analysis, QC , data submission, and
- Copies of all records, forms, and documents generated in the process are securely maintained on file until all aspects of the survey and resulting reports are completed.

All stages of infaunal sample processing and analysis, following receipt of samples in the laboratory including QC and data submission standards are described in this manual. In overview, the process (and the relevant sections) consists of the following tasks and activities:

1) Sample Treatment and Storage: the sample is washed free of fixative and transferred to an alcohol solution for processing and/or storage (**Section 1**),
2) Sorting: all organisms are removed from the debris contained in the sample and sorted into taxa groupings to facilitate subsequent taxonomic analysis (**Section 2**),
3) Taxonomic Analysis: all specimens in the samples are identified and counted (**Section 3**),
4) Data Submission: resulting data are loaded to an electronic data file compliant with this manual and submitted to the project Information Management officer (**Section 4**).
5) Quality Control: QC is required for steps 2 and 3 (Section 5) to ensure data consistency. QC consists of reanalysis of selected samples and taxonomist participation in workshops. Results of this process are used to determine whether the measurement quality objectives (MQOs) established for each of these steps are met.
6) Record keeping and Procedural responsibilities are described in **Section 6** and examples of Forms to be used during processing and QC are in **Section 8.**
7) Taxonomist qualification criteria are described in **Appendix A**.

In addition, taxonomists must participate in the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT).

§ 1. SAMPLE TREATMENT AND STORAGE

1.1 Upon receipt in the laboratory, samples will be in formalin fixative and must be washed and transferred to preservative. The removal of formalin is necessary for two reasons. Formaldehyde becomes increasingly acidic over time and prolonged exposure damages organisms with calcareous structures (*e.g.*, shelled mollusks). Also, formaldehyde is a noxious, potentially dangerous chemical; its replacement with ethanol makes subsequent handling of the sample safer. Other benefits of the washing process are the removal of excess silt from mudballs and fecal pellets that may have broken down during fixation and, in some cases, the opportunity to separate the bulk of organisms in a sample from the inorganic debris through the application of an elutriation process.

1.2 The samples are to remain in buffered fixative for at least 72 hours. No sample should remain in fixative for longer than two weeks.

1.3 The preservative to be used for all stages of Bight'03 infaunal samples is a 70% solution of ethanol. **Denatured alcohol is not permitted for this purpose**. No rose bengal for staining organisms is to be used.

1.4 It is recommended that the preservative be buffered with marble chips, especially if the ethanol produced by industrial distillation rather than fermentation.

1.5 Procedure

1.5.1 Select an appropriate sieve, which will be a 0.5mm or smaller sieve, and examine the mesh for holes and adhering organisms. Working under a fume hood and with eye protection, decant the fixative through the clean and intact sieve.

1.5.2 After decanting the formalin, refill the sample container with water, agitate gently by swirling, and wash the entire sample into the sieve.

1.5.3 Gently wash the sample with a low-pressure stream of water to remove any fine silt.

1.5.4 Using a spatula and wash bottle containing preservative, transfer the sample back to the sample container, top the sample with preservative (70% ethanol), and tightly affix the lid.

1.5.5 Place an internal label in each sample container bearing the station name, sampling date, split number (if more than one container is used; *e.g.*, 1 of 2). Labels are to be written in pencil or indelible ink on 100% rag-paper, poly-paper, or other paper suitable for permanent wet labels.

1.5.6 After each sample is washed, closely examine the sieve to assure that all organisms have been removed then thoroughly rinsed to avoid cross

contamination of subsequent samples.

1.5.7 Store infaunal samples in a safe and secure manner protected from environmental extremes. Avoid temperatures above 30°C as high temperatures will lead to evaporative loss of preservative

1.5.8 Routinely inspect all samples to assure that the container closure is tight and the preservative level adequate. If evaporative loss of preservative is evident, top-off the sample using 100% ethanol. The use of 70% ethanol for this purpose will lead to dilution of the sample preservative because of the different evaporation rates of ethanol and water.

§ 2. SAMPLE SORTING

2.1 Sorting is the process by which organisms (that were alive at time of collection) in a benthic sample are removed from the organic and inorganic residues (debris) that compose the sample and sorted into broad taxonomic categories for subsequent taxonomic analysis. Sorting must be accurate and complete to assure the value of all the subsequent steps in the sample analysis process.

2.2 Procedure

2.2.1 Begin the sorting process by filling out a Bight'03 Sorting Record form with the sample name, date, sorter's name, and date sorting begins. If the sample consists of more than a single jar, they are to be treated together as a single sample. Make sure you have all jars composing the sample.

2.2.2 Sort the sample under a stereo microscope. It is recommended that the sample be sorted in small-volume increments

2.2.2 The entire sample is to be sorted. If an unusual sample is encountered for which sorting of an aliquot may be a reasonable alternative, the laboratory supervisor will decide whether to allow sorting by aliquot.

2.2.3 ELUTRIATION. If a sample is primarily coarse sand, sorting can be greatly facilitated if inorganic material in the sample is separated from the lighter organic debris and organisms by the following elutriation process.

2.2.3.1 After washing the formalin from the sample, spread the sample material out in a shallow pan and cover with water.

2.2.3.2 Gently agitate the sample by hand to allow the lighter fraction of debris and organisms to separate from the heavier material.

2.2.3.3 Decant the water off with the lighter material through the sieve. Repeat the process several times until no more material is observed being carried off in the decanted water.

2.2.3.4 Collect the material carried off in the decanted water into a small sample container, top with preservative, and return to the original sample container along with the balance of the sample material. Fill the container with preservative and tightly affix the lid. Be sure that both the containers are properly labeled with internal labels.

2.2.4 All sorting must be done in 70% ethanol, with care taken to assure that the sample being sorted is always fully covered with alcohol.

2.2.5 The organisms removed from the sample are sorted into taxonomic lots for subsequent taxonomic analysis. Each laboratory will determine the taxonomic level of sorting adequate to their needs for subsequent sample analysis by their taxonomists.

2.2.6 Remove all individual organisms and fragments from the sample with the exception of nematodes, foraminiferans and planktonic species or life stages. All fragments, such as decapod chelae and legs, should be placed in their respective taxa lots. Sorters are to be instructed "***If in doubt, pick it out***".

2.2.7 Note on the Sorting Record form the number and identity of taxa lots composing the sorted sample, the number of containers used if sample is split, and the time (to the nearest ½ hour) required to sort the sample.

2.2.8 Aggregate the taxa lots into one or more sample containers. Each taxa lot should be internally labeled with the station name (a four digit number), sampling date and depth. Place an internal label in each sample container bearing the station name, sampling date, depth, split number (if more than one container is used). Labels are to be written in pencil or indelible ink on 100% rag-paper, poly-paper, or other paper suitable for permanent wet labels.

§ 3. TAXONOMIC ANALYSIS

3.1 The object of taxonomic analysis is to accurately identify all organisms contained within each sample to the lowest possible taxonomic category and to provide an accurate count of the organisms in each identified taxon.

3.2 The goal of the infaunal survey is to provide species level identifications whenever possible. However, because of difficulties in the taxonomy and the lack of expertise within the participating laboratories the following exceptions are made:

Kinorhynchs are identified to phylum Kinorhyncha
Oligochaete annelids are identified to class Oligochaeta
Hirudinean annelids are identified to class Hirudinea
Podocopid ostracods are identified to order Podocopida
Harpacticoid copepods are identified to order Harpacticoida

3.3 The number of organisms reported must account for all organisms in a sample alive at the time of collection. A corollary goal is to not count any individual more than once. Inevitably, samples contain fragments of organisms. Fragments of bilaterally symmetrical organisms will be identified and counted only if the fragment includes the anterior end of the organism. For radially symmetrical organisms (*e.g.*, ophiuroids, anthozoans) only fragments bearing the majority of the oral disk will be identified and counted. Also, care must be taken to avoid reporting empty mollusk shells or crustacean molts in the data.

3.4 The goal of the survey is to describe the macroinvertebrate infauna and epifauna living in soft-bottom habitats. Hard-bottom epifaunal organisms may occur incidentally in samples, particularly in settings where samples are collected immediately adjacent to hard structure (*e.g.,* in harbors near piers). As any records of these incidental contaminants would not be included in the analytical use of the data, these specimens are not to be counted nor included in the submitted survey data. Their presence may be noted on the bench sheets.

3.5 Attached parasites and other epibionts may be noted on the bench sheet as present but are not to be reported in the submitted survey data. Ectoparasites of fish such as cymothid isopods, which may be temporary members of the benthic community, are counted and reported in the submitted survey data.

3.6 Each taxonomist will use their own taxonomy bench sheets for recording the identifications and counts.

3.7 Nomenclature and orthography follows that used in the Edition 4 of the Southern California Association of Marine Invertebrate Taxonomists' taxonomic listing (SCAMIT, 2001). This list represents a consensus for standard usage of taxa names in POTW monitoring programs in the Southern California Bight. An electronic version of a species

list derived from that publication will be made available to the participating organizations submitting data.

3.8 The name used to represent a taxon should be that listed in the SCAMIT Taxonomic listing unless the name listed has been supplanted by a new synonym in which case the currently accepted synonym is to be used.

3.9 Taxonomists are to employ two standard notations (*Voucher* and *Exclude*) for the annotation of their bench sheets. While other non-standard notation may also be used, the use of these standard notations is required where applicable. In addition, both the Voucher and Exclude codes will be included as part of the electronic data record.

3.10 Exclude Notation

3.10.1 Form: The letters EX written on the row of the bench sheet containing the data record for the taxon to be excluded

3.10.2 Purpose: Provides an aid to data analysis when calculating metrics using the number of taxa present (e.g., diversity, species richness). This field in the final data set represents the taxonomist's recommendation that the reported taxon be excluded from counts of the number of taxa reported in the sample.

3.10.3 Rule of Use: The Exclude annotation is made on the bench sheet whenever a taxon should be excluded from counts of the number of taxa reported in the sample. This annotation is employed when three conditions co-exist:

The identification is not at the species-level (e.g., Pleustidae or *Polydora* sp),
And
The reported taxon is represented in the sample by other members of the same taxon, which have been identified at lower levels,
And
The taxonomist cannot determine if the specimen is distinct from the other members of its taxon represented in the sample.

3.10.4 It is necessary that the taxonomists make this evaluation during sample analysis (i.e., by annotation of the bench sheet). It cannot be effectively applied after the fact, as there is no way of determining later whether the third criterion for use was met.

3.10.5 The Exclude notation will be included as part of the electronic data record submitted by each laboratory. See the Bight'03 Information Management Plan for the proper format for its inclusion in the data file.

3.10.6 Examples of Use:

Both *Dipolydora* sp and *Dipolydora socialis* are reported in a sample and the

taxonomist cannot determine if the specimen reported as *D.* sp is distinct from *D. socialis.* Exclude (annotate record on bench sheet with **EX**)

An unidentifiable onuphid polychaete is reported as Onuphidae. It is the only member of its family present in the sample. **Do Not** Exclude

Both *Modiolus* sp and *Modiolus capax* are reported in a sample. However, the taxonomist is confident that the specimen identified at the genus-level is not *M. capax.* **Do Not** Exclude

§ 4. QUALITY CONTROL

4.1 The laboratory analysis of infaunal samples involves three processes: sample washing and preservation, sample sorting, and organism identification and enumeration. Quality assurance in the form of procedures and standardized reporting requirements are provided in this document for all three processes. Quality control exercises will be implemented at stages for which MQOs have been established (sample sorting, identification and enumeration). These exercises include repeating the procedures at each of these stages for a sub-set of samples. The results will be used to determine achievement of the MQOs established for each stage.

4.2 For the most challenging process, organism identification, additional quality control steps are included in order to foster comparability among the taxonomic data sets produced by the participating laboratories and taxonomists

4.3 Sample Sorting

4.3.1 Quality control of sorting is essential to assure the value of all the subsequent steps in the sample analysis process. An accuracy MQO of 5% (equivalent to 95% removal efficiency) has been set for this stage of the sample analysis.

4.5.2 A standard sorting form is used for tracking the sample. It includes the name of the technician responsible, time required for sorting, comments, and re-sorting results. Re-sorting of samples is employed for quality control of sorting.

4.5.3 A minimum of 10% of all material in samples will be re-sorted to monitor sorter performance and to determine achievement of the MQO of 5%.

4.5.4 Two alternative approaches (described below) are used for re-sorting; the Aliquot method, or the Whole Sample method. The method chosen is at the option of the laboratory. However, a single method must be employed for all samples for which a laboratory provides sorting. The re-sort method used must be noted on the sorting form along with results.

4.5.5 *Aliquot Method*: A representative aliquot of at least 10% of the sample volume of every sample processed by each sorter is re-sorted.

4.5.6 *Whole Sample Method*: At least 10% of the samples processed by each sorter are completely re-sorted.

4.5.7 Regardless of the method employed, an experienced sorter other than the original sorter conducts all re-sorting.

4.5.8 The responsible supervisor of each participating laboratory is responsible for selection of the method to be used for re-sorting and the unbiased selection of

samples and method of obtaining a sample aliquot.

4.5.9 The re-sorting process is to follow the procedures given in §2 of this document.

4.5.10 Percent sorting efficiency is calculated as follows:

Whole Sample Method:

$$\%_{Efficiency} = 100 * [\#Orgs_{Orig\ sorted} \div (\#Orgs_{Orig\ sorted} + \#Orgs_{from\ Re\text{-}sort})]$$

Aliquot Method:

$$\%_{Efficiency} = 100 * [\#Orgs_{Orig\ sorted} \div (\#Orgs_{Orig\ sorted} + \#Orgs_{from\ Re\text{-}sort} * \%_{aliquot})]$$

4.5.11 If sorting efficiency is greater than 95%, no action is required. Sorting efficiencies below 95% will require continuous monitoring of that technician until efficiency is improved. If the Whole Sample Method is employed, failure to achieve 95 % sorting efficiency will require re-sorting of all samples previously sorted by that technician.

4.5.12 Organisms found in the re-sort should be included in the results from the sample.

4.5.13 The calculated sorting efficiency is recorded on the Sorting Form for each sample for which QC re-sorting is conducted.

4.5.14 The laboratory responsible for the sorting must retain sample debris left after sorting. It is to be properly labeled and preserved with 70% ethanol. Upon completion of all quality control and assessment steps for the survey, the Benthic Committee Chairperson (or designee) will notify each participating laboratory that the sample debris may be discarded.

Appendix E. Water, Sediment and Tissue Chemistry & Bacteriology

Prepared by CRG Laboratories

1.0 TABLE OF CONTENTS

2.0 INTRODUCTION

2.1 CRG Marine Laboratories, Inc., Torrance, CA (CRG) is committed to providing quality environmental analytical services to all of its clients. To maintain this high level of quality, an extensive Quality Assurance Program (QA) has been implemented within CRG. The purpose of this manual is to document the QA practices utilized by CRG. It describes the applications and concepts employed to assure that results generated by CRG are in control, scientifically valid, of known highest possible quality, and can be used with a high degree of confidence by the client or user.

2.2 CRG is certified by the California Environmental Laboratory Accreditation Program (ELAP) for the analyses of inorganics, toxic chemical elements and organics in wastewater, Certificate No. 2261.

2.3 The format of this manual is patterned after that outlined in the California Department of Health Services Application for Environmental Laboratory Accreditation.

2.4 This document is intended for use as a reference document to CRG's Quality Assurance Program. It is designed to assist all staff members to perform the operations necessary to comply with all client and contractual requirements and to ensure that data produced by CRG conforms to the highest standards set by state and/or federal regulations.

3.0 ORGANIZATIONS AND RESPONSIBILITY

3.1 CRG operates two environmental laboratories at the following locations:

2020 Del Amo Blvd, Suite 200
Torrance, CA 90501

355 Van Ness, Suite 115
Torrance, California 90501

3.2 Quality Assurance Staff Responsibilities

The Laboratory Director is ultimately responsible and accountable for all activities related to the generation of technical data by or for CRG. In order to carry out these QA responsibilities and facilitate the integration of QA into all data generation activities, certain responsibilities have been delegated to other CRG employees.

3.2.1 The **Laboratory Director** is responsible for the following activities:

A. Provides leadership and technical direction for the organization

B. Removes barriers that limit the ability of individuals to obtain their goals and introduces change as a positive opportunity for the growth of the individual and CRG

C. Ensures that adequate QA/QC provisions are developed and incorporated into all laboratory data generation activities

D. Ensure that adequate resources are provided to meet these objectives

E. Ensure that specific QC procedures conform to the requirements specified by the client or project manager

F. Participates in appropriate certification programs and audit programs to establish credibility and demonstrate proficiency

G. Ensure that deficiencies or problems identified through audits are corrected as expeditiously as possible

H. Ensure that all routinely used analytical and administrative procedures are covered by well-written Laboratory Operating Procedures (LOP)

I. Ensure that all staff members are adequately qualified and trained to perform assigned tasks

J. Ensure that equipment is adequately maintained for the intended use

K. Ensure that the laboratory is a safe, efficient, and productive work environment.

3.2.2 The **Quality Assurance Specialist** is responsible for the following activities:

A. Maintain and update the Quality Assurance Program and this QA Manual

B. Serve as a QA liaison with clients and project managers

C. Coordinate accreditation/certification and auditing activities

D. Assess the adequacy of QC activities within the laboratory and keep the Laboratory Director informed of their effectiveness

E. Ensure that data is validated with respect to QC criteria

F. Ensure that all chain-of-custody requirements are met

G. Issue and evaluate the analyses of performance evaluation samples

H. Ensure that audit results are communicated with the appropriate staff and corrective actions are taken when needed

I. Identify and recommend staff training needs

J Work with the various laboratory staff to assure that LOPs are documented and meet the established quality standards

3.2.3 The **Organics Supervisor** is responsible for the following activities:

A. Develop, update, and implement modern state-of-the-art instrumental analysis techniques to cost-effectively meet CRG's requirements

B. Provide organic analytical testing services including priority pollutants and other regulated organic chemicals to CRG's clients

C. Validate data generated by the Organic Chemistry Section to assure that all quality objectives are met

D. Responsible for financial performance of the Organic Chemistry Section

E. Provide necessary training for all subordinates

F. Provide a safe working environment.

3.2.4 The **Inorganics Supervisor** is responsible for the following activities:

A. Develop, update, and implement modern state-of-the-art instrumental analysis techniques to cost-effectively meet CRG's requirements

B. Provide inorganic analytical testing services including metals and wet chemistry to CRG's clients

C. Validate data generated by the Inorganic Chemistry Section to assure that all quality objectives are met

D. Responsible for financial performance of the Inorganic Chemistry Section

E. Provide necessary training for all subordinates

F. Provide a safe working environment.

3.2.5 The **Microbiology Supervisor** is responsible for the following activities:

A. Develop, update, and implement modern state-of-the-art analytical techniques to cost-effectively meet CRG's requirements

B. Provide Microbiology analytical testing services including indicator bacteria, bacterial viruses and other microorganisms CRG's clients

C. Validate data generated by the Microbiology Section to assure that all quality objectives are met

D. Responsible for financial performance of the Microbiology Section

E. Provide necessary training for all subordinates

F. Provide a safe working environment.

3.2.5 The **Sample Custodian** is responsible for the following activities:

A. Receipt, login, and storage of all analytical chemistry samples

B. Review all chain-of-custody forms, record sample condition, and resolve inconsistencies and problems

C. Serve as liaison between Project Managers and Analysts with respect to handling rush orders

D. Purchase, label, preserve, pack, and ship all appropriate sample containers provided to clients

E. Ensure that all laboratory samples are ultimately disposed of according to the laboratory guidelines.

4.0 QA OBJECTIVES FOR MEASUREMENT DATA

4.1 Data Quality Objectives (DQOs) for the data collection activity describe the overall level of uncertainty that a decision-maker is willing to accept in results derived from environmental analyses. The objective of CRG's Quality Assurance Program is to ensure that the validity and reliability of the data meets client's requirements in terms of DQOs. The program follows the guidelines established by the California Department of Health Services and the U.S. EPA.

Since DQOs often vary with individual projects, CRG sets internal specifications that are strict enough to meet a majority of client's requirements. Project-specific DQO's can be found in the Quality Assurance Project Plans (QAPPs) for that project.

4.2 DQOs for analytical determinations are expressed in terms of accuracy, precision, detection limits, completeness, and comparability. Section 11 of this manual describes the types of quality control checks used to measure these objectives and the procedures used to derive them. Table 1 outlines typical accuracy, precision, and method detection limit objectives for each field of testing. Specific DQOs for each parameter are contained within the LOP used for anlaysis.

5.0 SAMPLING PROCEDURES

CRG provides trained staff for sample collection purposes. Proper sampling includes using appropriate equipment, containers, and preservation as well as following strict procedures for collection, storage, and transport to prevent cross contamination and loss of sample integrity.

CRG provides appropriate containers and sampling procedures to those clients who choose to perform their own sampling. CRG staff refers to EPA guidelines published in the Federal Register, 40 CFR Part 136.3 and Standard Methods for the Examination of Water and Wastewater, 20th Ed, for container selection and preservation.

6.0 SAMPLE CUSTODY

To produce legally defensible data, CRG maintains and demonstrates custody control of all samples. Two components of custody are addressed: physical possession and documentation.

6.1 Documentation begins with field records, including a chain-of-custody (COC) form, which follows the physical sample from the field to the laboratory. The Sample Custodian checks to insure that:

A. The sample container is clearly marked and agrees with the information provided on the chain-of-custody sheet

B. The evidence tape is unaltered and the container is intact

C. The sample was supplied in the proper type of container

D. The sample has not exceeded its maximum holding time

E. Sufficient sample volume exists to perform the requested analyses

F. Samples requiring analysis by a contract laboratory are packaged with an ice substitute and dunnage, and are shipped in an ice chest to the contract laboratory. A chain-of-custody sheet accompanies all samples shipped from CRG.

6.2 If samples are delivered without a COC, one is completed at the laboratory prior to acceptance of the samples. The Sample

Custodian shall note on the COC any discrepancies between the physical sample and the custody record.

6.3 Once received, each sample is assigned a unique laboratory ID number and logged into a bound Sample Receiving Logbook. Key characteristics are recorded into the logbook, the COC is filed with the project file, and the sample is placed in the appropriate storage location until analysis.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 All instrumentation is calibrated at a frequency that ensures the validity of the results. These procedures are carried out following USEPA guidelines and the recommendations of the instrument manufacturer.

7.2 Calibration standards are prepared either from purchased stock standards or from stock standards prepared in-house utilizing reagents suitable for the preparation of standards. When available, calibration standards are prepared from starting materials that are certified traceable to the National Institute of Standards Technology (NIST).

7.3 The following is a brief summary of the instrumentation calibration procedures employed at CRG. Detailed descriptions of these procedures are contained with the appropriate method.

7.3.1 The gas chromatograph or gas chromatograph mass spectrometer is calibrated using either an external calibration procedure or internal standard. For each parameter of interest, at least three to five different concentrations of standards are employed. One of the concentrations is near the Method Detection Limit (MDL) for each parameter. Concentrations of the remaining standards correspond to the expected range of concentrations found in the samples analyzed. Calibration standards are prepared by utilizing secondary dilution standards and/or stock solutions. Calibration standards may include a set of internal standards at a known constant amount. The base peak m/z shall be used as the primary m/z for quantification of the standards. Sensitivity of the instrument is checked every 10 samples by analyzing the external reference samples. If the result is not within a predetermined range, the problem is corrected, and the samples immediately following the last acceptable check are reanalyzed

7.3.2 The Inductively Coupled Mass Spectrometer (ICPMS) is calibrated before each use. For each parameter of interest, at least three to five different concentrations of standards are employed. One of the concentrations is near the Method Detection Limit (MDL) for each parameter. Concentrations of the remaining standards correspond to the expected range of concentrations found in the samples analyzed. Calibration standards are prepared by utilizing secondary dilution standards and/or stock solutions. Calibration standards may include a set of internal standards at a known constant amount. Sensitivity of the instrument is checked every 10 samples by analyzing the external reference samples. If the result is not within a predetermined range, the problem is corrected, and the samples immediately following the last acceptable check are reanalyzed

7.3.3 The performance of the balances is monitored against a set of calibration weights that are traceable to NIST (a log is maintained of these inspections)

7.3.4 Temperature records are maintained for all refrigerators, incubators, water baths, ovens. The temperatures are monitored at a frequency determined by how often the equipment is placed in service.

8.0 ANALYTICAL PROCEDURES

Analytical procedures are determined by current environmental regulations set forth by both state and federal guidelines. Analytical methods are published in CRG's Laboratory Operating Procedures Manual (LOPM). Revisions and updates of the LOPMs are developed as required. The LOPMs are numbered to correspond with their standard reference method.

8.1 The manual includes the methods employed by CRG for the analyses required to support CRG's clients

8.2 The format of the LOPM is patterned after those listed in the Code of Federal Regulations.

8.3 The LOPMs are prepared by senior members of the technical staff and approved by the Laboratory Director.

8.4 The LOPM is a controlled document. Each manual is assigned to an individual who has custodial responsibilities. Revised LOPMs

are issued with a new revision letter. The custodian updates the manual and is responsible for replacing the previous section(s) with the revised section(s). This insures that the analyst is always working to the latest revision of test procedures and protocols. A history file is maintained of all revisions to the LOPM. A memorandum is attached to each revision in the history file summarizing the reason for the change.

8.5 Research and development projects and methods development projects are documented in bound laboratory notebooks.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

Laboratory results are communicated to CRG's clients through the analytical report delivered either electronically or by mail. This document is based on the client's laboratory order or by group of related samples.

9.1 Data reduction- Data reduction is the process by which the analyst translates raw data into a reported result that is reviewed by a second party then approved by the section supervisor before being released in the final report. Specific calculations and verification processes are summarized in the respective LOPMs.

All determinations are performed by dedicated instrumentation equipped with a microcomputer. Results are stored in a computer file, reported in a printed report and then electronically transferred to the database. A sequence logs containing the sample position, and order of analysis is kept both electronically and hardcopy. Sample results are tracked by the computer filename cross-referenced to the unique sample ID number.

9.2 Data validation - Data validation involves ensuring the correct assignment of sample labels before instrument operation, checking the performance of the instrument, verification of successful completion of all quality-control checks, and fitness of the calculations performed by the computer.

9.3 Data Management - Sample analytical data including ID, date and time of collection and analyses, type of requested field and laboratory analyses, and results are entered into a Laboratory Information Management System (LIMS), which is a Microsoft Access-based database system. After data entry, all results from sample analyses and QA/QC are reviewed for accuracy and completeness and any reporting of laboratory results are based on queries from the LIMS.

9.4 Reports - Electronic and/or hard copy reports are provided based on client's need. The basic report includes a header containing the CRG sample ID number, date collected, date received, date processed, prepared, date analyzed, client sample information, batch ID number, replicate number, and instrument identification. Electronic data deliverables can be designed to meet any client requests and based upon queries of the LIMS database. The section supervisor prior to release to the client reviews the final report.

9.5 Records Storage - CRG archives all client final reports and instrument files in electronic format (pdf and/or Excel) for a period of 7 years following completion of project. CRG archives all laboratory records including raw data, charts, printouts and data books in hard copy format for a period of 7 years following completion of project.

10.0 INTERNAL QUALITY CONTROL CHECKS

Quality control measurements verify the integrity of the analytical results. While the goal of all quality control procedures remains constant, specific quality control procedures vary from method to method. Every analyst is responsible for a thorough understanding of the goals of each quality control measurements and the control analyses as required per method.

10.1 A batch is defined as a group of 20 or fewer samples of similar matrix, processed together under the same conditions and with the same reagents. Quality control samples are associated with each batch and are used to assess the validity of the sample analyses. Control limits can be found in Table 4.1 of this document. Each batch must include the following QC checks:

10.1.1 Method Blank- A method blank is a sample that contains no analytes of interest. For solid matrices, no matrix is used. The method blank serves to measure contamination associated with processing the sample within the laboratory.

10.1.2 Laboratory Control Material (LCM) or Certified Reference Material (CRM)- A LCM or CRM is a sample with a matrix similar to the client samples that contains analytes of interest at known or certified concentrations. It is used to determine the accuracy of the results based on the comparison of the measured concentration with the true value. For analytes

that are greater than 10 times the MDL, the acceptable percent recovery is presented in Table 4.1.

10.1.3 Duplicate Analyses- Duplicate analyses are samples that have been split and processed within a single batch. They are used to determine the precision of the results based on the percent relative difference (%RSD) between the two sets of results. Control limits for %RSD are presented in Table 4.1.

10.1.4 Matrix Spike/Matrix Spike Duplicates (MS/MSD)- MS/MSD are samples of similar matrix to the client's samples that are spiked with a known amount of analyte. Spike recovery measures the effect of interferences caused by the sample matrix and reflects the accuracy of the determination. The spike level should be at least ten times the MDL. The duplicate spike may be used to determine the precision of the analytical results similar to Section 10.1.3.

10.1.5 Tuning Check- The tuning of the mass spectrometer is checked at the beginning of each run to insure that it is providing adequate spectra.

10.1.6 Initial Calibration- Initial calibration is performed by analyzing standards of known levels of concentration. The lowest level should be less than or equal to ten times the MDL and the remaining levels should represent the entire range of expected concentrations in the samples.

10.1.7 Calibration Verification- When a calibration curve is not performed for each run, a calibration verification is performed with a standard from, preferably a second source, is used to verify that the instrument is still operating within the original calibration curve.

10.1.8 Internal Standard- An internal standard is a non-target analyte, which is added to samples and QC checks after the preparation of the sample, just prior to analysis. It is used to compensate for variations in the instrument response from one sample to the next.

10.1.9 Recovery Surrogate- A recovery surrogate is a non-target analyte or analytes that are added to the sample prior to processing. It is used to indicate the extraction efficiency and instrument variation from sample to sample.

11.0 PERFORMANCE AND SYSTEM EVALUATIONS

CRG is dedicated to the continuous improvement of all of its operational systems. This is an essential part of everyone's job within CRG. Internal evaluations are conducted by staff from the Laboratory and are performed on a periodic basis.

11.1 CRG employs the philosophy of Continuous Measurable Improvement systems to evaluate its process performance and to identify opportunities for improvement on a continual basis. Five key elements are essential for the Continuous Measurable Improvement system to work efficiently. The first is to establish open and honest communication among all personnel. The second is to encourage decision making by delegating responsibility to the lowest appropriate levels of the work force. The third is to provide positive recognition for achievements and to strive continuously to identify and strengthen areas needing improvements. The fourth is to provide employees with the knowledge, skills, motivation, and working environment to meet their full potential and find personal satisfaction in their work. The fifth is to accept the concept of change as a positive opportunity for growth for both the individual and the organization.

11.2 With the five key elements of this philosophy in place, all levels of personnel can develop a true quantitative measurement system for assessing the status of meeting target goals in a wide variety of processes (i.e. improved accuracy, precision, training, safety, working environment, etc.). The system begins with a quantitative evaluation of the process based on a review of both historical and current capability and performance. Individual processes are selected as proposed projects based on whether they are in statistical control, predictable, and have attained target goals. CRG then prioritizes the selected projects based on frequency and magnitude of problem recurrence. Root-cause analysis is employed to establish control and eliminate the true sources of problems. Corrective actions are taken and the process is rerun to verify stability, capability and quality. If necessary, new target goals are set for the process and the system is repeated until the acceptable goal is achieved.

12.0 PREVENTIVE MAINTENANCE

12.1 Service contracts may be maintained for the major instrumentation and equipment that are no longer under warranty. The gas

chromatographs, ICPMS instrumentation, ion chromatograph and balances are typical examples of equipment that might be covered by a maintenance contract. Records of maintenance are kept by the person responsible for the equipment. Specific examples of routine preventive maintenance are further discussed in the following sections:

A. Hewlett Packard 5972 Gas Chromatograph/Mass Spectrometer System

1. Every six months, replace the MSD foreline pump oil and foreline trap pellets. During the fluid exchange, replace the outlet mist filter

2. Every year, check and if necessary replace the diffusion pump fluid

3. As needed, clean the ion source of the MSD (typically every six months)

4. As needed, the glass injector sleeve and injector septum for the split-splitless injector is replaced (typically once per month)

5. As needed, the gas purifiers and filters for the carrier gas are replaced

B. Hewlett Packard 4500 ICPMS System

1. Every six months, replace the oil and foreline trap pellets for the rough pumps. During the fluid exchange, replace the outlet mist filter

2. Every year check and replace the turbo molecular pump fluid

3. Once per month, clean the sample and skimmer cones

4. Once per week, replace the peripump tubing

5. As needed, clean the ion source of the mass spectrometer

6. Every three months, clean the nebulizer

13.0 ASSESSMENT OF PRECISION AND ACCURACY

13.1 CRG utilizes several methods to monitor precision and accuracy. These are designed to determine the reproducibility of the analysis (precision) or agreement of the result to the actual value of the analyte (accuracy). CRG routinely performs analysis of blind samples. This procedure is explained in section 14. The following definitions describe the types of analyses performed to assess precision and accuracy:

A. Duplicate analyses involve performing two separate analyses of a particular parameter on the same sample. Precision is measured by the degree of agreement between the two sample results. Duplicate analyses are designed to measure the precision of a determination when the sample contains detectable amounts of the constituent

B. Laboratory control material or certified reference material are samples that have known concentrations of the target analytes. These concentrations are either based on a series of analyses or are certified by an external laboratory such as NIST. Accuracy is determined by comparing the measured amount of analyte recovered during analysis to the known value

C. Sample spikes are samples that a known amount of the analyte has been added. Accuracy is determined by the amount of the added material recovered during analysis

D. Blank spikes or water spikes are used if poor recovery from a spiked sample occurs, analysis of blank spikes is useful to determine if the poor performance is a function of the sample matrix or the analytical process. These consist of the usual sample portion of deionized water spiked with the constituent at a concentration equivalent to that of the sample spike

E. Replicate spike analyses are employed to determine the precision and accuracy of an analysis when some or all of the parameters being determined are below the detection limit. The replicate spike procedure involves analyzing the sample and two portions of the sample spiked with a measured portion of the same analyte. Relative precision of the spikes can be determined as well as the accuracy of the analysis. Spike concentrations are sufficient to eliminate the

bias that would be created by the undetectable quantity of the parameter being determined

13.2 One set of duplicate samples or spike duplicates, a LCM or CRM sample, and a method blank are analyzed with each batch of samples.

13.3 The ongoing evaluation of relative precision and accuracy performance is accomplished by the generation of control charts. Employing a minimum of 20 results, control limits are generated utilizing the mean and standard deviation of the data set. Upper and lower "warning" limits are twice the standard deviation from the mean of the set of results for accuracy charts and twice the standard deviation from the origin for precision charts. Upper and lower "out of control" limits are three times the standard deviation from the mean for accuracy charts and three times the standard deviation from the origin for precision charts. When relative precision or accuracy results suggest atypical performance, an investigation into the problem is initiated. If a sample result is outside the out-of-control limits, the sample is reanalyzed. If samples cannot be reanalyzed, the result is flagged.

14.0 CORRECTIVE ACTIONS AND TRAINING

14.1 Corrective Actions

14.1.1 Corrective action is the process of defining- root-cause, identifying and implementing corrective action plans, educating - and training to provide system-wide solutions, and verifying that the improved system is being followed. Corrective action responses are divided into three separate categories based on the time required to complete the-corrective action. An immediate corrective action occurs when a response that fully meets closure criteria can be carried out in the same time frame that the observation of the discrepancy occurs. An intermediate corrective action is one that will require a maximum of 30 days to complete the response satisfactorily. A long-term corrective action requires a time period greater than 30 days to provide a complete response. Long-term corrective actions typically involve cooperation of additional organizational elements.

14.1.2 Both intermediate and long-term corrective actions require a detailed corrective action plan showing clearly defined milestones, task descriptions, and responsibilities. CRG's

Quality Assurance Specialist must approve all intermediate and long-term corrective action plans. Closure of corrective actions require verifiable, objective evidence that the corrective action be thorough, comprehensive, and will permanently prevent the problem from reoccurring. Corrective actions result from a wide variety of situations including:

A. Inspection of the sample indicates the: samples are 1) not representative of their source, 2) deteriorated, 3) improperly labeled, 4) damaged in transport, or 5) collected in an inappropriate container. In this case, the CRG Sample Custodian or Quality Assurance Specialist will notify the sample collector of the problem(s) and request a new sample(s) to be collected following proper sample collection and handling methods

B. Samples that are not properly preserved, stored at incorrect temperatures, or exhibit deficiencies in the chain-of-custody records are not analyzed. The CRG Sample Custodian or Quality Assurance Specialist reviews the discrepancy with appropriate personnel and new samples are collected employing correct methods

C. The required LOPM has not been followed correctly. The supervisor reviews the Method with the analyst and requests the analyst to rerun the analysis, per the method, under the supervisor's direct observation. The analyst repeats the procedure until it is correctly performed. The analyst's performance of the method's protocol and results are evaluated randomly over a minimum of a two week period to ensure adherence to all requirements of the method

D. Instrumentation malfunctions are immediately noted in the instrument logbook and the supervisor is notified. Senior technical staff with specific in-depth knowledge of the particular instrument reviews the problem and attempt to fix the instrument. Major problems may require trained field service personnel from the manufacturer to be brought in to fix the problem. If the projected downtime will extend beyond the samples required holding time, the sample will be either analyzed on another instrument or sent to an approved contract laboratory for analysis

E. When duplicate results, spike recovery results, or Quality Assurance reference samples are outside their acceptance limits, the supervisor is notified and the complete analytical procedure is reviewed with the analyst. The data entry and calculations are reviewed for transcription errors. Reagents and standards are checked to see if they were properly prepared and whether they are within their shelf life. The equipment is examined for proper performance. The calibration and maintenance record is reviewed to ensure the instrumentation is performing optimally. The methodology is reviewed to make sure that it is properly applied. Sampling and sample handling protocols are verified to ensure that the sample was collected properly and the recommended preservation and holding times were observed. If the cause of the problem is found, the Quality Assurance Specialist sends a Quality Assurance reference sample to the analyst for analysis. If the Quality Assurance check sample is acceptable, the duplicate or spike analysis is reanalyzed. However, if the same result is obtained in the repeat analysis, the problem is probably due to matrix interference effect. The results of the sample batch are reported with an accompanying explanation of possible matrix interference. If the precision of duplicate spike analyses improves and are in control, the sample batch run with the initial duplicate spike analysis sample is reanalyzed. A different scenario must be followed in circumstances such as insufficient sample or analysis of the sample after the prescribed holding time exists. In these situations, the original result is reported and accompanied by a failure report stating the circumstances that occurred in the initial and repeat analysis. If the results for the Quality Assurance reference sample are not satisfactory, a team will be formed to identify and correct the problem. The analysis will not be resumed until the system is in control

F. CRG's internal evaluation and corrective action program and external agency audits can result in corrective actions. The response to these evaluation studies requires a written corrective action plan that has been accepted by the Quality Assurance Specialist. Closure requires objective evidence that the corrective

action be thorough, complete, and will permanently solve the problem

G. CRG's Continuous Measurable Improvement program is designed to identify opportunities for improvements systematically. This program leads to specific corrective actions initiated by either a combination of senior technical staff and analysts or a team established to address the specific problem. A quantitative measurement is applied to ensure that the corrective action has had a positive impact on eliminating the problem.

14.2 Training

14.2.1 Educational background- the minimum qualification for conducting analyses in the laboratory is two years of college-level course work in science and two years of related analytical work experience or an equivalent combination of education and experience. These education and experience requirements provide the analysts with a proper background in the fundamentals of chemistry to assist in understanding the principles behind work that they perform.

14.2.2 Orientation- CRG provides a general orientation to working in an environmental chemistry laboratory. CRG also provides a basic safety orientation, which includes lab coats, specific safety instructions, approved footwear, location of first aid supplies, location of eyewash stations, location of emergency showers, and location of fire extinguishers

14.2.3 Ongoing Training- CRG maintains a technical library of key journals and books for staff's use. Staffs are encouraged to join professional societies, attend conferences, and receive additional training in their technical fields.

14.2.4 Discrete Job Training- CRG Provides:

A. On-the-job training to new analysts or analysts assuming additional responsibilities.

B. Maintains a file for each employee which contains all information relating to the analysts education and training including:

Resume
Certificates from training classes and courses
Completed Training Documentation Forms
Related data

C. The following approach is used for providing staff on-the-job training:

1. Read the appropriate Laboratory Operating Procedures Method which details the analytical procedure

2. Review the associated material safety data sheets if you are not knowledgeable of the

safety hazards of the reagents used in the analysis

3. Observe the procedure in use by an analyst who is approved for performing this analysis

4. Perform the analysis under the direct supervision of a qualified analyst who will certify the successful completion of training

5. Demonstrate proficiency using the method by analyzing blind check samples

6. Document the successful completion of your training using the following Training Documentation Form:

CRG Marine Laboratories, Inc.
2020 Del Amo Boulevard, Suite 2020
Torrance, California 90501-1206

TRAINING DOCUMENTATION FORM

EMPLOYEE NAME _____

METHOD NUMBER	DATE COMPLETED	CERTIFIED BY

COMMENTS:

15.0 QA REPORTS

Numerical results of quality control analyses are delivered as part of the analytical report package. Reports that discuss corrective actions, Quality accomplishments, control charts, and ad-hoc inquiries are generated internally on a regular basis and made available to clients upon request.

Appendix F Field Data Sheets & Chains of Custody

Prepared by
Aquatic Bioassay & Consulting Laboratories

From:				To:		
Aquatic Bioassay and Consulting Labs. 29 N. Olive St. Ventura, CA 93001	**Phone:**	(805) 643-5621		**Company:**	Kim Kratz	
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	Project ID:	**VCWPD Fall 05**		**Phone:**	**503 231 2155**	

						ANALYSIS									
Sample I.D. No.	**Sample Date**	**Time**	**Matrix**	**Volume/ No.**	**Reps**	**Annelids**	**Misc. Arthropods**	**Insects**	**Ostracods**	**Mollusca**	**Other Phyla**	**Unusual Animals***	**Remnants**		

Special Instructions: *Animal found in grids that were not sorted. Animals should not be counted in final data set.

RELINQUISHED BY: DATE: TIME:	RECEIVED BY: DATE: TIME:	RELINQUISHED BY: DATE: TIME:	RECEIVED BY: DATE: TIME:

Figure E-1. Example chain of custody.

Aquatic Bioassay & Consulting Laboratories
Field Data Sheets and Chain of Custody

Watershed/Stream: _____ **Station ID:** _____

Client: _____ **Date/Time:** _____

Sampling Crew: _____ **Site Description:** _____

Elevation/Ecoregion: _____

☐ **High Gradient** ☐ **Low Gradient** **% Gradient:**_____ **Reach Length (feet):** _____ **Physical Habitat Quality Score:** _____

Water Quality

Water Temperature (°C): _____
Specific Conductance (µS/cm): _____
Dissolved Oxygen (ppm): _____
pH: _____

Low Gradient Streams (%)

Hard Substrate[1] _____ Submerged Vegetation _____
Soft Substrate[2] _____ Stream Bank Vegetation _____
Woody Debris _____

Transect #	Transect Location (ft)	Latitude (Degrees and Decimal Minutes)	Longitude (Degree Decimal Minutes)	Datum	Velocity (ft-m/sec)	Substrate Consolidation	Avg. Riffle Length (ft)[3]	Avg. Riffle Width (ft)	Avg. Depth (cm)	Comments
1										
2										
3										

			Substrate Composition					Densiometer				
Transect #	Substrate Complexity	Embed-dedness	Fines (<0.1")	Gravel (0.1-2")	Cobble (2-10")	Boulder (>10")	Bedrock (solid)	Upstream	Left Bank[4]	Down-stream	Right Bank[4]	% Canopy Cover[5]
1												
2												
3												

Comments: _____

1. Hard substrate of natural rock or cement. 2. Soft substrate of sand or mud. 3. High gradient streams only. Average length for low gradient streams=6 ft.
4. To determine left and right bank, always face downstream. 5. % Canopy Cover: 17 square, # covered

Figure E-2. Bioassessment field data sheet.

Project ID: _____ **Vessel:** _____

Station: _____ Date: _____ Arrive Time: _____ Depart Time: _____ Depth (m): _____

* Latitude: _____

* Longitude: _____

Weather (Chk One)
☐ Clear ☐ Rain
☐ Overcast ☐ Drizzle
☐ Prtly Cldy ☐ Fog
☐ Thunderstorm

Sea State (Chk One)
☐ Calm
☐ Choppy
☐ Rough

Van Veen Type
☐ Single Van Veen
☐ Tandem Van Veen

Visibility (km): _____ Wind Spd (Kts): _____ Wind Dir[1]: _____ Station Fail Code[2]: _____

Swell Ht (ft): _____ Swell Dir[1]: _____ Period (sec): _____ Water Color[3]: _____ Turbidity: _____

Comments: Crew:

Grab No. (rep) / Time	Grab Fail Code[4]	Volume (L)	Sediment Comp[5]	Surface Color[6]	Subsurface Color[6]	Sediment Odor[7]	Odor Strength[8]	Sample Type: Infauna	Sed Chem	Grain Size	Sed Tox	Sample In Relaxant (time)	Sample In Formalin (time)
1								☐	☐	☐	☐		
2								☐	☐	☐	☐		
3								☐	☐	☐	☐		
4								☐	☐	☐	☐		
5								☐	☐	☐	☐		
6								☐	☐	☐	☐		
7								☐	☐	☐	☐		
8								☐	☐	☐	☐		

[1] Direction in compass headings: N, S, E, W, NE, NW, SE, SW
[2] Station Failure List: rocky bottom, kelp bed, reef, obstructions, <3m (bay), <6m (ocean), >120m
[3] Water Color: Blue, Green, Blue-Green, Brown, Red Tide (note strength)
[4] Grab Failure Codes: A = canted, B = washed out, C = poor closure, D = disturbed surface, E = <5cm
[5] Sediment Composition: coarse sand, fine sand, silt/clay, cobble, gravel, mixed (include shell hash if appr.)
[6] Sediment Color: brown, black, gray, olive green, red
[7] Sediment odor: none, petroleum, hydrogen sulfide, other
[8] Odor Strength: weak, moderate, strong
* If subsequent grab positions differ form the position above, record those on back of page.

Figure E-3. Estuary sediment field data sheet.